CURRICULUM FOR

DIPLOMA IN

CIVIL ENGINEERING

SEM I, II, III, IV

V & VI

SET I

Semester - I

Course code	Name of Course	L	T	P	C	TH	TM	PR/OR	TW	Total marks
		TEACHING SCHEME				EXAMINATION SCHEME				
						Theory Marks		Practical Marks		
GN102	Engg. Maths - I	4	2	-	6	75	25			100
GN103	Applied Physics-I	4		2	6	75	25	-	50	150
GN106	Basic Engg.Skills	-	-	6	6	-	-	50	100	150
GN105	Comp. Fund & App.	-	-	4	4	-	-	50	50	100
GN203	Environmental Studies	3			3	75	25	-	-	100
Total		11	2	12	25	225	75	100	200	600

Semester - II

Course code	Name of Course	L	T	P	C	TH	TM	PR/OR	TW	Total marks
		TEACHING SCHEME				EXAMINATION SCHEME				
						Theory Marks		Practical Marks		
GN202	Applied Physics-II	4	-	2	6	75	25	-	50	150
GN201	Engg. Maths II	4	2	-	6	75	25	-	-	100
GN104	Applied Chemistry	3		2	5	75	25	-	50	150
GN101	Communication skills	-	-	2	2	-	-	50	50	100
GN205	Engg. Materials	4	-		4	75	25	-	-	100
GN204	Engg. Drawing	2	-	4	6	-		50	50	100
Total		17	2	10	29	300	100	100	200	700

SEMESTER I

GN 102 ENGINEERING MATHEMATICS- I

1.   RATIONALE

There are variable and constant concepts in the engineering phenomena and problems, which need to be understood, analyze and predict their behaviour. For instance, motion and acceleration of an object under applied known force, effect of temperature and pressure under constant volume, etc. All these situations require modeling of constants and variables into a relationship known as formula (formulating) and solving problems of engineering by substituting the values of constants and variables. Thus mathematics is used to understand, analyse and find solutions. There are some standard principles and formulae, which should be understood by students and apply as per needs of situations in real life.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
GN-102 Engineering Mathematics	4	2	-	6	75	25	-	-	100

Minimum passing % : Theory 40%

Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations; **TW**- Term Work*

3.   DETAILED COURSE CONTENTS

Unit 0	Fundamentals of algebraic mathematical operations

- Use of scientific calculator
- Recall of algebraic operations & formulae
- Solving of simultaneous equations with two variables

Unit 1   Co-ordinate Geometry/ Analytic Geometry;

Purposes/Applications of Co-ordinate Geometry. Coordinate systems. *Straight Line-* Distance between two points. Internal & external division of a line. Area of triangle. Slope of line. Angle between two lines. Various forms of equation of line-parallel to axis, point-slope form, slope intercept form, two point form, intercepts form & normal form. General equation of line. Distance of a point from a line. - Equations of circle,   Equations of tangent & normal to circle.

Unit 2   Trigonometry

Purposes/Applications of Trigonometry. Radian. Radian & degree. Area of sector & length of an arc. Trigonometric ratios of any angle & Trigonometric identities. Trigonometric ratio of allied angles, compound angles, & Multiple angles(only 2A). Sum & product formulae. Sine, Cosine rules. Solution of triangles

Unit 3   Limits & Functions

Functions- constants, variables. Kinds of functions (question not to be asked). Concepts of limits- algebraic, trigonometric, logarithmic & exponential functions (No question on method of substitution and Inverse Trigonometric function)

Unit 4   Differential Calculus

Purposes/Applications of Differential Calculus. Definition of Derivative. Derivatives of standard functions-applications. Derivative of sum, difference, product & quotient of a function. Derivative of composite, implicit & parametric functions with reference to - algebraic, logarithmic, trigonometric, inverse circular functions, exponential functions & logarithmic differentiations. Introduction to Second order derivatives.

Unit 5   Application of derivatives

Geometrical meaning of derivatives. Equation of tangent & normal to curves.   Derivatives as rate, motion, related rates. Maxima & minima.

4.   SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Co-ordinate Geometry	14	20
2	Trigonometry	17	16
3	Limits & Functions	8	12
4	Differential Calculus	15	20
5	Application of derivatives	10	07
		64	75

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication & Year
1.	Deshpande S.P.,	Mathematics for Polytechnics	Griha Prakashan, Pune, 1996 or latest
2.	Grewal B.S;	Engineering Mathematics	Khanna Pub., New Delhi1995 or latest
3.	Prasad, I.B.;	Engineering Mathematics	Khanna Pub., New Delhi1997 or latest
4.	TTTI, Bhopal	Mathematics for Polytechnics Vol. – I & Vol. – II	TTTI, Bhopal Latest
5.	Wartiker P.N.,	Applied Mathematics	Griha Prakashan Pune, 1996 or latest

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GN 103 APPLIED PHYSICS-I

1. RATIONALE:

Being the basis of all engineering branches, the students must acquire knowledge of basic principles; laws and facts of Physics This knowledge will improve their ability to apply it in solving engineering problems and overall growth of their disciplines.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-103 Applied Physics I	L	T	P	C	TH	TM	TW	PR/OR	
	4	-	2	6	75	25	50	-	150

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1   UNITS & DIMENSIONS
Fundamental and Derived Physical Quantities and their SI units. Dimensions and Dimensional formula, Principle of Homogeneity, use of Dimensional Analysis for checking the correctness of an equation. Definition of least count of Vernier Caliper, Micrometer Screw Gauge.

Unit 2   KINEMATICS
Vectors and Scalars-Definition, Difference between vectors and scalars, types of vectors with example. Definition - Displacements and distance, Velocity and speed, uniform and average velocity, Uniform acceleration and retardation, problems based on kinematic equations for uniform acceleration. $V=u+at$, $S=ut + \frac{1}{2} at^2$, $v^2 = u^2 + 2as$. Velocity- time diagram, Motion under gravity.

Unit 3   PROPERTIES OF MATTER

Definition of Elasticity, Stress, Strain and Elastic limit. Hooke's Law. Definition of Young's modulus, Bulk modulus, Rigidity modulus. Determination of Young's modulus by Searle's method. Behaviour of wire under continuously increasing stress. Definition of Yield Point, Breaking Stress, and Factor Of Safety. Adhesive and Cohesive forces. Angle of contact. Concept and definition of Surface Tension, Surface Tension by Capillary rise method. Application of Surface Tension. Definition and explanation of Viscosity. Statement of Newton's law of viscosity, Terminal Velocity (no derivation) Stokes Law. Determination of Viscosity by Stokes method. Streamlined and Turbulent flow. Definition of Critical Velocity, Reynolds Number.

Unit 4   HEAT

Definition of specific heat and units of specific heat. Modes of transfer of heat transfer, Conduction, Convection and Radiation. Law of thermal conductivity. Definition of co-efficient of thermal conductivity. Determination of coefficient of thermal conductivity of a good conductor

Statement of Charles's law, Boyle's law and Gay Lussac's law. Derivation of general gas equation.

Unit 5   ELECTROSTATICS

Coulomb's Law of Electrostatics, Electric Field, Intensity of Electric Field, Electric Potential and its unit, Potential difference between two points (no derivation), Potential of a sphere, Potential of Earth, Definition and units of Capacitance, Principle of Capacitor, Capacitors in series, Capacitors in Parallel.

Unit 6   MAGNETISM

Magnetic Effect of Electric current (Oersted's Experiment) Magnetic Field, Intensity of Magnetic Field. Coulomb's Law of Magnetism, Magnetic lines of Force, Magnetic Induction, Expression for Magnetic Induction at the centre of a Circular coil carrying current (no derivation), Force acting on straight conductor placed in Magnetic Field (no derivation).

Unit 7 (A)   LAWS OF FORCES & FRICTION (MECHANICAL AND ALLIED GROUPS)

Triangle law of forces, parallelogram law of forces (expression only), graphical & analytical representation of force, resolution of forces, resolving force into rectangular components.
Definition & concept of friction, types of friction, Force of friction, Laws of static friction, Coefficient of friction, angle of friction (expression only), angle of repose(only qualitative aspects)

OR

UNIT 7(B) : SEMICONDUCTORS (ELECTRONICS AND ALLIED GROUPS)

Energy Band structure of electronic material(conductor , semiconductor and insulator)
Definition of semiconductors, types of impurities added to the semiconductors, intrinsic and extrinsic semiconductors.
Types of semiconductors P- type and N- type, Structure of P- type and N- type,
Extrinsic   semiconductor using pure Si and Ge semiconductors.
Types of carriers; N- type and P- type
Process of recombination of carriers.
Formation of P-N junction and depletion region.

4.SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Units and Dimensions	5	5
2	Kinematics	9	12
3	Properties of Matter	13	14
4	Heat & Gas Laws	9	10
5	Electrostatics	12	12
6	Magnetism	8	10
7A	Laws of Forces & Friction	8	12
	OR		
7B	Semiconductors	8	12
	Total	64	75

7A-Mechanical and allied branches   7BFor Electronics and allied branches

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Use of Vernier Caliper
2	Use of Micrometer Screw gauge
3	Determination of Surface tension by capillary rise method using Travelling Microscope.
4	Determination of coefficient of viscosity by stroke's method.
5	Determination of acceleration due to gravity ('g') by simple pendulum.
6	Determination of Young's modulus by Searle's method.
7	Determination of Coefficient of thermal conductivity by Searle's method.
8A	Find resultant force using parallelogram of forces
8B	Draw and interpret band structure of Insulator, Semiconductor and conductor, Band structure of P-type & N-type extrinsic semiconductor, Drawing PN junction.

6. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1.	Halliday D and Resnickr	Physics Part-I & II	Latest
2.	Das S.K., Sisodiya M.L., Neher P.K., Kachhawa C.M.,	Physics Part-I & II for 10+2 Students	Latest
3.	B.G. Dhande	Applied physics for polytechnics	Latest
4.	Bhandarkar	Applied Physics for polytechnics	Latest
5.	Saxena HC & Singh Prabhakaer	Applied Physics Vol. I & II	Latest
6.	Rao, B.V.N.	Modern Physics	Latest
7.	R.K.Guar and S.L. Gupta.	Engineering Physics	Latest
8.	B.L. Thereja.	Engineering Technology	Latest
9.	Modern Publishers.	ABC of Physics	Latest
10.	V.K Mehta	Elements of electronic engineering	Latest
11	R S Khurmi	Applied Mechanics	Latest

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GN-105 - COMPUTER FUNDAMENTALS & APPLICATIONS

1. RATIONALE

The course on Computer Fundamentals & Applications will enable the students to understand the basic concepts related to computer fundamentals, Data Representation & Number Systems, Computer Languages, operating system, Computer Software and Internet Technology and will be able to apply the same in different areas of electronics engineering. Laboratory practice will help in developing the requisite skills.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
GN-105 Computer Fundamentals & Applications	-	-	4	4	-	-	50	50	100

Minimum passing % : Theory 40%

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

UNIT 1   Computer Fundamentals

1. Introduction to Computer

2. History, Evaluation, Classification and Generations of computers

3. Organisation of the Computer System

4. Hardware

   Input device, Memory or Storage Devices, Processing Unit, Output device, Scanner

   Printers.

5. Communication technology and evolution of communication mediums

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6. Software

     System software

     Application Software

     Shareware

     Freeware

     Open Source

7. Concept of Computer Viruses

     Definition

     Types

     Preventive Measures

UNIT 2   Operating System

1. Introduction to operating system

  Definition   Functions ,   Types,   Examples,   Comparisons of Various Operating Systems

2. Windows Operating System-

GUI(Graphical user Interface), desktop, Start Menu, Task Bar, Status Bar, Scroll Bar, Title Bar, Toolbar, Menu Bar. File Organization: Creating, Saving, Deleting, Renaming, Cutting, Pasting, copying, moving, Searching Files and Folders. Applications: My Computer, Recycle Bin, Windows Explorer, Control Panel.

UNIT 3   Application Software
1. MS Word
- Introduction
  - o Starting MS Word
  - o Creating, saving and opening a document
  - o Editing commands-Cut, Copy, Paste, Paste Special
  - o Text Formatting, Bullets and Numbering, Borders and shading etc.
  - o Tabs, Style, Views
  - o Insert Table, Picture, OLE Objects, etc.
  - o Checking Spelling and Grammar, Thesaurus
  - o Page Layout & Printing
  - o Mail Merge.
2. MS Excel

- o Create, Save and open a worksheet
- o Entering data – text, numbers and formulae in a worksheet, Hyperlink
- o Navigating within a Worksheet and also between different Worksheets of a Workbook
- o Inserting and deleting cells, rows and columns in a worksheet
- o Select, copy, paste and delete cell data within the worksheet
- o Using various formulae and inbuilt functions like Trigonometric, Statistical, Logical, Data Sorting
- o Update worksheets using special tools like spell check and auto correct.
- o Setup the page and margins of worksheets for printing
- o Enhance worksheets using charts & graphs

3. MS Power Point

- o Introduction and starting the program
- o Starting a presentation
- o Adding new slide
- o Saving and Opening presentation
- o Text formatting options
- o Copy, Move and delete slides and text
- o Applying designs
- o Using Animations
- o Slide Transitions, Hyperlink
- o Insert clip art
- o Viewing the presentation

UNIT 4   The Internet

Networks, Advantages of networking, Types of networks.

- o History and Functions of the Internet
- o Working with Internet
- o Web Browsers, World Wide Web, Uniform Resources Locator and Domain, Names, Issues related to web security.
- o Uses of Internet
- o Search for information, Email, Chatting, Instant messenger services, News Group, Teleconferencing, Video-Conferencing, E-Commerce and M-Commerce.

Email

- o Manage an E-mail Account
  E-mail Address, Configure E-mail Account, log to an E-mail, Receive E-mail, Sending mails, sending files an attachments and Address Book

- o Downloading Files

4. SUGGESTED LIST OF EXPERIMENTS

S. No.	Unit No.	List of Experiments
1	1	Identify Input and output devices
2	1	Calculate capacity of different storage device
3	2	Identify OS and different application software s loaded on that OS
4	3	Load Windows operating system. Configure and load relevant device drivers

5	4	Practice on Windows 95/98/2000 ; o Starting Windows, Exploring the desktop, Arranging windows, My Computer, The start button, Creating Shortcuts, Practice on moving and sizing of windows o Study of file organization: creating, copying, moving, renaming and deleting o Practice on Windows Accessories- Notepad, Word Pad and Paint o Editing document & formatting text, Previewing and printing document/Image file o Practice on Windows Explorer o Recycle bin o Shutting down windows
6	4	Practice on MS-Word ; o Create and format document o Edit and Modify text- changing font size type and style o AutoText, AutoComplete, AutoCorrect, grammar and spellchecker, Find and replace of text o Open save and print a document o Insert, modify table o Insert graphics o Mail merge
7	5	Practice on Microsoft Excel o Create, save & format worksheet o Open and save worksheet file o Edit & modify data o Use formula and functions o Split windows and freeze pans o Data sort and security features o Create, edit, modify and print worksheet. o Create and edit charts
8	5	Practice on PowerPoint o Create, edit, insert, move, slides o Open and save presentation o Insert picture, audio slide layout, action button o Apply custom animation o Present slide show
9	6	Practice on: o Identification of type of Account. o Connecting to internet o Dial up access o Web browsing o Searching websites o Information searching o Email services o Creating email accounts & Receiving and sending mails

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication & Year
1	Norton Peter	Introduction to Computers (special Indian edition)	Tata McGraw Hills New Delhi, 6th Edition, 2005 ISBN: 0070593744
2	Kahate Atul	Information Technology	Tata McGraw Hills New Delhi, ISBN-13:9780070593718
3	Williams Stalling	Using Information technology: A Practical Introduction to Computers and Communication	Tata McGraw Hills New Delhi,
4	Curtin	Information Technology: The Breaking Wave (book only)	Tata McGraw Hills New Delhi, ISBN:0074635581
5	Ravichandran, D	Introduction to Computers and Communication	Tata McGraw Hills New Delhi, ISBN: 0070435650
7	Douglas E.	The Internet Book	Prentice Hall of India, New Delhi, 3rd Edition, ISBN: 812032286X
8	Basanbhara S.K.	Computer Today	Nita Mehta Publications, 2003 ISBN: 8186340742

GN 106 BASIC ENGINEERING SKILLS

1. **Rationale**:

A technician is expected to work on the shop floor. It therefore becomes essential for him to have a through exposure to safety aspects, fire fighting, first aid as he is the guide for the skilled and unskilled personnel working under him. From technical knowledge and skills point of view he is also expected to have knowledge on proper ways of using various hand tools, measuring devices etc. in addition to other engineering skills.

The course on Basic Engineering skills is aimed at providing him the knowledge and skills in all those areas through shop instructions, demonstrations and skill development exercises. This course is also aimed at providing the student the exposure to engineering equipment which will help him to assimilate the teaching which takes place at higher semesters.

2. **Teaching And Examination Scheme**

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(GN106) Basic Engineering Skills	L	T	P	C	TH	TM	PR/OR	TW	150
	0	0	6	6	-	-	50	100	

Legends: L-Lectures; P-Practical; C-Credits; TH-End Semester Theory; TM-Test Marks;

PR/OR-End Semester Practica/Oral Examinations TW- Term Work

3. **Detailed Course Contents**

Unit 1: General Safety, Housekeeping, Fire Fighting & First Aid   Introduction to General Safety aspects of engineering workshop, meaning and importance of housekeeping, possible fire hazards, fire triangle, types of fire extinguishers – selection and use, basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.
Unit 2: Fitting Workshop Practice   Introduction to the trade, Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools, Types of files and filing methods. Drill bits and drilling Processes, using portable and pillar drilling machine. Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling tapping and deing. Use of spirit level and plumb bob.
Unit 3: Carpentry Workshop Practice   Introduction to the trade, types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools, wood working processes. Different types of joints and their usage. Introduction to wood working machines- lathe , circular saw, band saw, wood planner, universal wood working machine.
Unit 4: Electrical Workshop Practice

Brief introduction to power distribution, different hand tools used in electrical trade, different measuring instruments. Making of cable joints. Measurement of current, voltage, frequency and Power Consumption. Connecting and starting of Induction Motor. Changing of Direction of rotation of induction motor. Introduction to commonly used electrical Fittings (Domestic & Industrial). Reading of simple electrical drawings.

Unit 5: Basic Electronics Workshop Practice
Introduction to basic electronic components, Introduction to use of Multimeter in measuring voltage, current, resistance, capacitance. Checking of connectivity. Introduction to soldering process. Soldering Irons- Types and wattage. Reading of basic electronic circuits.

Note: during first 20 minutes of the practical session, Instructor shall provide theoretical knowledge as prescribed in the curriculum. (Shop Talk)

Unit No.	Topic	Hours/ Semester
1.	General Safety, Housekeeping, Fire Fighting & First Aid	06
2.	Fitting Workshop Practice	36
3.	Carpentry Workshop Practice	18
4.	Electrical Workshop Practice	18
5.	Basic Electronics Workshop Practice	18
	Total	**96**

GN203 ENVIRONMENTAL STUDIES

1. RATIONALE

Due to various developmental activities carried out by man, our environment is continuously being abused and getting degraded. The air we breathe, water we drink, food we eat, land we live on, all are getting spoiled day by day. The purity of our environment is of prime importance for survival of human race on the earth. Man should not go for developmental activities at the cost of environment. This subject has been introduced in the Diploma Programme to bring about awareness towards the environmental purity amongst the students.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN203 Environmental Studies	L	T	P	C	TH	TM	TW	PR/OR	100
	3	-	-	3	75	25	-	-	

Minimum passing %: Theory 40%   *Duration of Theory Paper: 3 Hrs.*

3. DETAILED COURSE CONTENT

Unit 1 Multidisciplinary Nature Of Environmental Studies.
Definition, scope and importance. Need for public awareness.
Unit 2   Natural Resources
Renewable and nonrenewable resources. Natural resources and associated problems.   • Forest resources: Use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.   • Water resources: Use and over-utilization of surface and ground water, floods, droughts, conflicts over water, dams- benefits and problems.   • Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Case studies.   • Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer & pesticide problems, water logging, salinity, case studies.

- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land resources: Land as a source, land degradation, man induced land slides, soil erosion and desertification.

  Role of an individual in conservation natural resources. Equitable use of resources for sustainable life styles.

Unit 3 Ecosystems.

Concept of an ecosystem. Structure and function of an ecosystem. Producers, Consumers and Decomposers. Energy flow in the ecosystem. Ecological succession. Food chains. Food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: (a) Forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) Aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, and estuaries).

Unit 4.   Biodiversity And Its Conservation.

Introduction – Definition: genetic, species and ecosystem diversity.

Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Unit 5. Environmental Pollution.

Definition. Causes, effects and control measures of: Air pollution, water pollution, soil pollution, marine pollution, noise pollution, Thermal pollution, Nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of individual in prevention of pollution. Pollution case studies. Disaster management: flood, earthquakes, cyclone and landslides.

Unit 6. Social Issues And The Environment.

From unsustainable to sustainable development. Urban problems related to energy. Water conservation rainwater harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns; case studies. Environmental ethics: Issues and possible solutions. Climatic change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; case studies. Wasteland reclamation. Consumerism and waste products. Environmental protection act. Air (Prevention and control of pollution) Act. Water (Prevention and control of pollution) Act. Wildlife protection Act. Forest conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit 7. Human Population And The Environment.	

Population growth, variation amongst nations. Population explosion – Family welfare programme. Environment and human health. Human rights. Value education. HIV / AIDS. Women and child welfare. Role of Information technology in environment and human health. Case studies.

Unit 8. Field Work.

Visit local area to document environment assets – river / forest / grassland / hill / mountain. Visit to a local polluted site – urban / rural / industrial / agricultural. Study of common plants, insects, birds. Study of simple ecosystems – ponds, river, hill slopes, etc. (field work equal to 6 lecture hours).

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours	Marks
1)	Multidisciplinary Nature Of Environmental Studies.	01	03
2)	Natural Resources.	10	12
3)	Ecosystems.	06	08
4)	Biodiversity And Its Conservation.	06	09
5)	Environmental Pollution.	08	12
6)	Social Issues And The Environment.	07	12
7)	Human Population And The Environment.	04	09
8)	Field Work.	06	10
		48	75

5. MANDATORY ACTIVITIES

In addition to the class room instruction, visits should be arranged in any 2 of the following areas:

1. Visit to NIO or Science Centre.
2. Visit to Selaulim/ Anjunem Dam.
3. Visit to study ecosystem (Pond, Stream, River, and Forest).
4. Visit to show Hill cuttings, mining areas.
5. Visit to show Rain water harvesting project / Vermicomposting plant / Watershed management project. (Krishi Vigyan Kendra – Old Goa)
6. Visit to water treatment/ waste water treatment plant.

6. SUGGESTED VIDEOS

In addition to the class room instruction, video films on environment may be shown.

7. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication
1	Erach Bharucha	Textbook of Environmental Studies for Undergraduate courses	University Press
2	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)
3	S. Deswal & A. Deswal	A Basic Course in Environmental Studies.	Dhanpat Rai & Co.
4	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
5	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions.	S. Chand & Co
6	Centre for Environmental education	Video Film	Thaltej Tekra, Ahme
7	Dr. S.K. Dhameja	Environmental Studies	

SEMESTER II

GN 101 COMMUNICATION SKILLS

1.   RATIONALE

This course deals with Student's proficiency in English by developing their skills in reading, writing and speaking. They will be able to appreciate the usage of grammar. Acquiring proficiency in English is absolutely essential for effective communication while serving on the job. It also deals with applications of the concepts and principles learnt. Using visuals in written communication and body language in oral communication highly enhances the effectiveness of the communication process. These and some other important aspects are discussed in this course. The practice-feedback-practice cycle is of utmost important for developing the communication competencies/skills.

2.   TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-101	L	T	P	C	TH	TM	TW	PR/OR	
Communication Skills		-	2	2	-	-	50	50	**100**

Minimum passing % : Practical 40%
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   DETAILED COURSE CONTENTS

Unit 1 - Fundamental of Communication skills

Definition, components (message, sender, receiver, transmission medium and protocol), types(verbal & no-verbal, technological & non-technological, etc), importance of communication skills, effective communication skills (phatic stage, personal stage and intimate stage), barriers in effective communications(verbal, non-verbal), barriers while speaking, other barriers (individual's viewpoints, emotional block, etc.) methods of and hint to increase communication skills, body language.

Unit 2 – Presentation Skills

Methods and styles of presentations (seminars, speeches, etc), the plan, objectives, audience, structure (sequential, hierarchical, question oriented pyramid, meaty sandwich), tips for good beginning and end, aids to presentation (visual, verbal), delivery style (eyes, voice, expression, appearances, stance, etc), techniques for a good speech (repeat, draw (signs, pictures), jokes, etc).

Unit 3 - Technical Reports, Letter Writing, CVs

Functions of Reports (information, initiate action, recommend new procedures, recording, coordinating project), techniques (basic format, steps, appendices), types of reports (emphasis on progress reports, industrial visit reports, inspection reports, accident reports, survey report, report on seminars, workshop, technical gathering, etc).

Types of letters, format function, qualities of a good letter, examples of job applications, leave applications, complaints, purchase orders, enquiries replies etc.

Brief mention of importance of etiquette in email communication, importance of careful proofing the documents sent.

Curriculum Vitae – definition, sample, tips for a good CV, covering letter

Unit 4 - Soft Skills

Importance of values, attitude and etiquettes in communication, ethics and manners, courtesy, honesty and reliability; personal integrity, flexibility – adaptability, team skills – cooperation; ability to follow regulations; willingness to be accountable; Ability to relate to co workers in a close environment, non verbal communication, leadership skills – self directed, ability to direct and guide others, self-supervising; ability to relate to co workers in a close environment; positive attitude; positive work ethic, written communication Skills- basic spelling and grammar; reading and comprehension, personal hygiene and energy, interpersonal skills – communication skills with public, fellow employees, supervisors, and customers, motivation – willingness to learn; caring about seeing the company succeed; understanding what the world is all about; commitment to continues training and learning; critical thinking skills, grooming – good personal appearance.

Unit 5 - Language Workshop

The Reading, Listening, Writing, Speaking Skills will be tested

1. **Reading Skills:**

   Articles from the newspapers, magazines, journals etc. will be given to the students to read aloud thus checking their pronunciation, clarity and their style of reading.

2. **Listening Skills:**

   Passages, Topics, Stories, Speeches of eminent people will be read or played. The students have to listen and their listening skills will be tested.

3. **Writing Skills:**

   a) Students to write on any given topic

   b) Students to compose their own stories

   c) Students will be given a particulars situation i.e. accident, college gathering etc. and asked to write a report

4. **Speaking Skills:**

   a) Students to speak on any given topic

   b) Narrate a story written by them.

Group discussions in the classroom. This could include debates, discussion on current issues, role-playing.

4. List of Experiments :

- Oral presentation about technical products for five minutes.
- Seminar Presentation/Report writing and presentation on identified topics from science and technical subjects for short duration.
- Group discussion on science and technical topics.
- Organise mock interviews.
- Organise debates.
- Extempore speech for three minutes on a topic.
- Observe a process and reproduce orally in own words for three to five minutes.
- Arrange video recording of presentations for self-feedback.

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Year of Publication
1	Wren and Martin	Practical English Grammar	1992
2	John Sinclair (ed.),	Collins Cobuild English Grammar	William Collins & Sons Cp., London 1990
3	Krishna & Mohan,	Effective English Communication	Tata McGraw Hill, New Delhi 2000
4	Randolf, Quirk & Sidney Greenbaum	University Grammar of English	1993
5	Tiwari, N.P. et al ,	Communication Skills for Technical Students – Book	Somaiya Publications, 1995
6	Tiwari, N.P. et al,	A Communicative Grammar of English	Somaiya Publications, 1989

GN 104 APPLIED CHEMISTRY

1.   RATIONALE

Applied Chemistry is multi-disciplinary science having wide applications in all the branches of engineering and technology. In simple terms, it is the science of chemical phenomena in various engineering situations. An understanding of the basic concepts of applied chemistry is essential not only for all chemists but also for engineers. Therefore it forms an indispensable base for them. The emphasis is given more on applications of principles of chemistry to engineering situations rather than fundamental principles only. It also develops in the students the habit of scientific enquiry, ability to investigate the cause and effect relationship, ability to interpret and analyze the results under given conditions.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-104 Applied Chemistry	L	T	P	C	TH	TM	TW	PR/OR	150
	3	-	2	5	75	25	50	-	

Minimum passing % : Theory 40%

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   DETAILED COURSE CONTENTS

Unit 1   Atomic Structure and Chemical Bonding
Fundamental particles and their characteristics, Energy levels - definition, designation of energy levels, Bohr- Bury's laws for distribution of electrons in shells (1st three laws only), concept and shape of orbitals (s and p only), Quantum numbers-designation, definition, values, Aufbau and Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, orbital electronic configuration of elements with atomic number 1 to 20, Lewis and Langmuir concept of stable configuration. Concept of electrovalent, covalent and co-ordinate bond, Formation, properties and examples of electrovalent compounds (NaCl, MgO, $CaCl_2$) covalent compounds (Cl_2, O_2, N_2, CO_2)and coordinate compounds (O_3, SO_2).

Unit 2 Electrochemistry

Arrhenius theory of electrolytic dissociation., Degree of Ionisation- definition, factors affecting degree of ionisation , Nature of solute and solvent, concentration of solution, and temperature, Strong and weak electrolytes - definition and examples, Concept of the terms involved in electrolysis –conductor, insulator, electrolyte, non-electrolyte, electrolysis, electrodes, electrolytic cell, cathode, anode and current density, electrochemical series- concept and significance. Mechanism of electrolysis, Ionisation, primary reactions at the cathode, activity series of cations, primary reactions at the anode, activity series of anions, electrolysis of i. Fused NaCl using carbon electrodes, ii. aqueous NaCl using platinum electrodes iii. aqueous $CuSO_4$ using platinum electrodes iv. aqueous $CuSO_4$, using copper electrodes);

UNIT 3 Water and its treatment

Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) for industrial use - dyeing, textile, sugar, paper, bakeries, (ii) in boilers for steam generation with special reference to sludge and scale formation (no chemical equations), zeolite and ion exchange process for water softening, desalination by electro dialysis and reverse osmosis, concept of pH

Unit 4 Corrosion and Its Control

Definition, Atmospheric corrosion (direct chemical corrosion) - definition, Oxidation corrosion, the nature of the oxide film, stable, unstable and volatile, mechanism of oxidation corrosion, corrosion due to other gases. Immersed corrosion (electrochemical corrosion) - definition, factors necessary for electrochemical corrosion , Galvanic cell corrosion, concentration cell corrosion- metal ion concentration and differential aeration. Mechanism of electrochemical corrosion- Hydrogen evolution mechanism, Oxygen absorption mechanism, Protection of metals from corrosion; galvanising, tinning, metal spraying , proper designing , using pure metals, using metal alloys, Cathodic protection- sacrificial anode and impressed current .Modifying the environment- De-aeration, De-activation, De-Humidification and alkaline neutralization.

Unit 5 Lubricants
Definition, functions of Lubricants, Types of Lubrication, Fluid Film, Boundary, Extreme Pressure, Classification of Lubricant - solid, semi- solid, liquid synthetic oils. Characteristics of Lubricants, Definition and Its significance -Viscosity. Viscosity Index, Flash and Fire Point, Oiliness, Pour Point, Volatility, Acidity, Emulsification and Saponification Value. Selection of Lubricants for Delicate Instruments, High Pressure and Low Speed Machines, Extreme Pressure and Low Speed Machines, Mechanisms of Lubrications.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (Theory)

Unit No.	Name of the unit	Hours	Marks
1	Atomic Structure and Chemical bonding	10	15
2	Electrochemistry	08	13
3	Water and its treatment	09	15
4	Corrosion and its control	16	25
5	Lubricants	05	07
	Total	**48**	75

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	Unit No.	List of Experiments
1.		Double titration of acid and base using phenolphthalein
2.		Double titration of acid and base using methyl orange
3.		Redox titration of potassium permaganate, ferrous sulphate and oxalic acid.
4.		Determination of degree of hardness of water by EDTA method
5.		Determination chloride content of water by Mohr's method
6.		Determination of total alkalinity of water sample
7.		Titration of strong acid and strong base using pH meter
8.		Determination of conductivity of water
9.		Titration of strong acid and strong base using conductometer
10.		Corrosion susceptibility of aluminium to acid or base.

6. SUGGESTED LIST OF ACTIVITIES

S.No.	Title
1.	Quiz on Electronic configuration of atoms.
2.	Demonstration of process of electrolysis
3.	Demonstration of purification of water by domestic/economical method.
4.	Identification and application of lubricants in different equipment/glasswares used in different laboratories
5.	Visit to some metallurgical industries for demonstration of different processes of metallurgy.
6.	Preparation of chart of different alloys of steel and their uses
7.	Seminar on different aspects of fuel, properties and usages
8.	Use of pH paper for testing different samples of water, blood etc.
9.	Demonstration and use of different samples of paints, varnishes, drying oils, pigments, thinners, dryers, fillers, plasticizers and anti-skinning agents.

7. SUGGESTED LEARNING RESOURCES

Sl. No.	Author	Title	Publication and Year
1.	M.M. Uppal	A text book of Engineering Chemistry,	Khanna Publishers
2	V.P. Mehta	A textbook of Engineering Chemistry,	Jain Bros. Delhi
3	S.N. Narkhede	A Textbook of Engineering Chemistry	Nirali Prakashan
4	R.A. Banawat, S.K. Mahajan, S.K.Mehta	Textbook of Applied Chemistry	India Book House
	V.S. Godbole	Applied Chemistry	
5	R.S. Sharma	Textbook of Engineering Chemistry	Khanna Pubnlishers
	P.C. Jain and M. Jain	Engineering Chemistry	
6	J.C. Kuriacose and J. Rajaram	Chemistry in Engineering	Tata McGraw Hill Publishing Co.Ltd., New Delhi
7	Dr.S. Rabindra and Prof.B.K. Mishra	Engineering Chemistry:	Kumar and Kumar Publishers (P) Ltd., Bangalore -40
8	S.S.Kumar	A Text book of Applied Chemistry-I	Tata McGraw Hill, Delhi
9	Sharma	A Text book of Applied Chemistry -I	Technical Bureau of India, Jalandhar
10	S.S.Dhara	A Textbook of Engineering chemistry	S.Chand & Company, New Delhi
11	Dr. G.H. Hugar	Progressive Applied Chemistry – I & II	Eagle Prakashan, Jalandhar

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GN201 ENGINEERING MATHEMATICS- II

1. **RATIONALE :**

   Mathematics is the backbone of all areas of engineering and technology and hence technician / engineers need to study relevant theories and principles of mathematics to enable them to understand and grasp the concept of advance courses of the curriculum. With above in mind, the necessary content for the engineering mathematics is derived to understand advance use of mathematics in solving engineering problems.

2. **TEACHING AND EXAMINATION SCHEME :**

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
GN-201 Engineering Mathematics-II	4	2	-	6	75	25	-	-	100

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. **DETAILED COURSE CONTENT :**

Unit 1   Determinants   Determinants of the second order and third order, solutions of equations in two or three variables using Cramer's Rule
Unit 2   Binomial Theorem - Binomial Theorem for a rational index, general term of binomial expansion, middle term (s).
Unit 3   Mensuration - Volume and surface area of - Prism, pyramid, frustrum of a sphere, frustrum of pyramid, frustrum of cone, Area and volume by Simpsons Rule
Unit 4   Matrices   Definition and Notations,   Elements of Matrix, Types of matrices, Special matrices - Square, Diagonal, Row, Column, Scalar Unit, Zero or null, upper and lower triangular matrices, Symmetric, Skew symmetric matrices . Addition, Subtraction and multiplication of matrices, Inverse of matrix using Adjoint method only Application of matrices in solving simultaneous equations in 2 or 3 variable.
Unit 5 Integral Calculus   Definition, fundamental properties. Methods of Integration - Integration by substitution, Integration by parts, Integration by partial fractions.. Definition of Definite Integral Properties of definite integrals, Application of integration, area under a plane curve, volume of revolution.(simple sums only)

Unit 6 Differential Equations
Definition, order and degree of a differential equation, solutions of differential equations of first order and first degree-variable separable type only. Second order differential equation of type $d^2y/dx^2 = f(x)$ only, Application of differential equation in engineering problems

Unit 7 Statistics (Mechanical and Allied Engg. Branches)
. Measures of central tendency for grouped and ungrouped data - Mean, Median and Mode . Measures of dispersion for grouped and ungrouped data -range , mean deviation, standard deviation, variance and co-efficient of variation

OR
Unit 7 Complex Numbers. (Electronics engg and Allied branches)
Definitions, Argand diagrams , polar form of a complex number, Addition, Subtraction, Multiplication & Division of a complex number. Exponential and circular function, Demoivres theorem, roots of a complex number- Cube roots of unity, n th roots of unity, , hyperbolic functions

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY):

Unit No.	Topic	Teaching Hours/ Semester	Marks
1.	Determinants	5	7
2.	Binomial Theorem	7	10
3.	Mensuration	7	10
4.	Matrices	11	08
5.	Integral Calculus	17	20
6.	Differential equations	08	10
7.	Statistics	09	10 $
OR			
7	Complex Numbers	09	10 #
	Total :	64	75

$- for Mechanical and allied branches

 # - For Electronics and allied branches

5. SUGGESTED LEARNING RESOURCES :

S.No.	Author	Title of Books	Publication & Year
1.	Deshpande S.P,	Mathematics for Polytechnics	Griha Prakashan, Pune, 1996 or latest
2.	Grewa, I B.S;	Engineering Mathematics	Khanna Pub., New Delhi1995 or latest
3.	Prasad, I.B.;	Engineering Mathematics	Khanna Pub., New Delhi1997 or latest
4.	Wartiker P.N.,	Applied Mathematics	Griha Prakashan Pune, 1996 or latest

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GN 202 APPLIED PHYSICS-II

1. **RATIONALE:**

   Physics is one of the basic building blocks for engineering sciences. Therefore, the students need to describe and explain the basic principles, laws & facts of physics. These skills will enhance their ability to apply it in solving engineering problems related to their respective branches of engineering

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-202 Applied Physics-II	L	T	P	C	TH	TM	TW	PR/OR	
	4	-	2	6	75	25	50	-	150

Minimum passing % : Theory 40% and Practical 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. **DETAILED COURSE CONTENTS**

Unit 1   FORCE, WORK, POWER, AND ENERGY
Definition of Force and its units. Types of Forces with example- Direct, Remote action e.g. Gravitational Force, Magnetic Force, Electric Force. Effect of Forces on body-External, Internal.   Work-definition and units, Graphical Representation of workdone, Energy definition and units.   Types of Mechanical Energies- K.E. & P.E. Law of Conservation of Energy, Total Energy, Power-definition and units, Power (Force X Velocity)

Unit 2   CURRENT ELECTRICITY
Ohms law, General equation of Ohms law, Factors affecting resistance, specific resistance and units. Effect of temperature on resistance, Law of resistance in series and parallel. Internal resistance and EMF of the cell. Potential drop along a uniform wire. Principle of potentiometer. Comparison of EMF of a given cell by single cell method. Camparision of EMF of a given cell by sum and difference method. Use of meter bridge to determine the unknown resistance.   Definition of Electric power and energy in d.c. circuit. Concept of Kilowatt hour, calculation of energy bills.

Unit 3   ELECTROMAGNETISM Electromagnetic Induction, Faraday's Laws of Electromagnetic Induction, Lenz's Law, Self Induction & Mutual Induction.
Unit 4   LOGIC GATES Introduction to Binary Number System, Concept of '0' and '1' in Binary System. Binary equivalent of Decimal numbers from 0 to 10 Logic Gates: 1. 'NOT' Gate , 2. 'OR' Gate 3. 'AND' Gate. NAND , NOR GATE Their Logic Representation & Truth Table
Unit 5   SOUND Definition and examples of Free and Forced Vibrations, Resonance. Determination of velocity of sound using Resonance Tube. Definition of Beats (No derivation),   Beat frequency & application of Beats, Definition of Echo, Reverberation & Reverberation time, Sabine's Formula, Acoustical Planning of an Auditorium. Factors affecting Reverberation Time, Ultrasonic waves, Piezo Electric Effect, Applications of Ultrasonic waves.
Unit 6   CIRCULAR MOTION AND GRAVITATION Defination of Uniform Circular Motion, Angular Displacement, Angular Velocity, Relation between Linear and Angular velocity, Defination and concept of Centripetal and Centrifugal Force.(No derivation), Expression for velocity of a vehicle moving on a curved Horizontal Road, Expression for Angle of Banking & Super Elevation of Road. Newton's Law of Gravitation, Force of Gravity. Acceleration due to Gravity, Expression for Acceleration due to gravity.
Unit 7(A) FUNDAMENTAL CONCEPTS OF SIMPLE MACHINES **   (MECHANICAL AND ALLIED GROUPS)** Definition of efforts, velocity ratio, mechanical advantage & efficiency of machine and their relationship. Laws of machines, examples of simple machine, definition of ideal machine, systems of pulleys (First & Second). Determination of velocity ratio ,Mechanical Advantage & Efficiency. OR **Unit 7 (B) RECTIFIERS** **   (ELECTRONICS AND ALLIED GROUPS)** V-I characteristics of P-N junction. Diode as a rectifier. Half wave rectifiers, working, input and output waveforms, percentage regulation,$((V_{NL} - V_{FL}) / V_{FL}) \times 100$ Full wave rectifier with centre tap transformer, working, input and output waveforms, percentage regulation Bridge rectifier, working, input and output waveforms, percentage regulation

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS(THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	FORCE, WORK,POWER & ENERGY	10	12
2	CURRENT ELECTRICITY	16	16
3	ELECTROMAGNETISM	6	8
4	LOGIC GATES & AWARNESS TO NANO SCIENCE	4	6
5	SOUND	8	9
6	CIRCULAR MOTION & GRAVITATION	10	12
7A	FUNDAMENTAL CONCEPTS OF SIMPLE MACHINES	10	12
	OR		
7B	RECTIFIERS	10	12
	Total	**64**	**75**

7A- for Mechanical and allied branches   7B- For Electronics and allied branches

5. LIST OF EXPERIMENTS

1. Determination of Specific resistance of a material wire by Voltmeter and Ammeter.
2. Determination of Internal resistance of a given cell by using Potentiometer.
3. Calibration of Voltmeter by using Potentiometer.
4. Comparison of E.M.F. of two given cells by single cell method using potentiometer.
5. Determination of specific resistance by meter bridge.
6. Verify the law of resistances in series by meter bridge.
7. Verify the laws of resistances in parallel by meter bridge.
8. Determination of velocity of sound by Resonance tube.

6. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title	Publication and Year
1.	Halliday D and Resnickr	Physics Part-I & II	Latest
2.	Das S.K., Sisodiya M.L., Neher P.K., Kachhawa C.M.,	Physics Part-I & II for 10+2 Students	Latest
3.	B.G. Dhande	Applied physics for polytechnics	Latest
4.	Bhandarkar	Applied Physics for polytechnics	Latest
5.	Saxena HC & Singh Prabhakaer	Applied Physics Vol. I & II	Latest
6.	Rao, B.V.N.	Modern Physics	Latest
7.	R.K.Guar and S.L. Gupta.	Engineering Physics	
8.	B.L. Thereja.	Engineering Technology	
9.	Modern Publishers.	ABC of Physics	
10.	V.K Mehta	Elements of Electronic Engineering	

GN 204 ENGINEERING DRAWING

1. RATIONALE:

Drawing is a graphical language of engineering field. Engineering technician irrespective of his field of operation in an industry is expected to possess a thorough understanding of drawing, which includes clear spatial 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 on a piece of paper. Besides this he is also expected to possess a certain degree of drafting skill- depending upon his job functions-in his day-to-day activities. This course of Engineering Drawing for Diploma courses is aimed at developing basic knowledge and skills of engineering drawing and use of computer in the field of Engineering Drawing.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-204	L	T	P	C	TH	TM	TW	PR/OR	
Engineering Drawing	2	-	4	6	-	-	50	50	100

Minimum passing % : Theory 40% and Practical 40%   *Duration of Theory Paper: 3 Hrs.*

Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

***PR/OR** - End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENT

Unit 1   Introduction
• Importance of Engineering drawing as a means of communication. • Introduction to drawing equipment, instruments and their uses. • Planning of drawing sheet as per I.S. 696 - 1972. • Indian standard practices of laying out and folding of drawing • Different types of lines used in engineering drawing. • Importance of scale in Engineering Drawings. • Lettering

Unit 2	Dimensioning techniques and standard conventions

- Methods of dimensioning, Dimensioning terms and notation (use of I.S. code 696 and 2709), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, counter sunk hole, screw thread, taper etc.
- Conventional representation of various materials.

Unit 3	Engineering Curves & Shapes

- Construction of an Equilateral and Isosceles triangle,Square,Rhombus,Regular pentagon & Regular hexagon given distance across the corners/ flats and given length of a side using general method of construction
- Types of Engineering curves
- Construction of Engineering curves like
  o Ellipse- by focus & directrix method and arcs of circles method
  o Parabola- by focus & directrix method and rectangule or oblong method
  o Hyperbola- by transverse axis & Focus and directrix method
  o Cycloid- by generating circle rolling on a straight line
  o Involutes of a triangle ,circle & pentagon
  o Draw normal & tangents to the above curves from given point on the curve
- Practice problems of drawing various engineering curves

Unit 4	Orthographic projection

- Definitions of various terms associated with orthographic projections.
- Planes of projections.
- Concept of Quadrants.
- First and third angle method of projection.
- Projection of points
- Projection of lines
  (i) Parallel to both Principal planes
  (ii) Parallel to one and Perpendicular to other Principal plane.
  (iii) Inclined to one plane and parallel to other plane.

- Projection of Triangle, Square, Rhombus, regular Pentagon when inclined to one principal plane & perpendicular to other plane.

- Introduction to the following solids
  Cylinder, cone, cube.

  Right regular solids such as

  (i) Prism: Triangular & Square
  (ii) Pyramid: Square & Pentagonal.
  - Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane.
  - Conversion of simple pictorial views into orthographic views.

- Practice problems on projection of points, lines and planes.
- *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 projection of plane are given, true shape & slope angle are to be drawn are excluded.*

Unit 5   Section of solids

- Concept of sectioning planes
- Auxiliary planes and true shape of section.
- Drawing projections and section of solids like square prism, square pyramid, pentagonal 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)

Unit 6   Development of lateral surfaces

- Concept and importance of surface development in the engineering field.

  Methods of development of surfaces-Radial & Parallel line method.

  Development of surfaces for the following right regular solids-
- Cylinder
- Prism
- Cone
- Pyramids
- Development of solids standing on its base & cut by a plane inclined to either VP/HP and perpendicular to the other is also included.
- *Practice problems on above with top & bottom of the solid is excluded*

Unit 7   Isometric Views

- Limitations of orthographic projections.
- Procedure for preparing isometric projections.
- Difference between Isometric projection & Isometric view.
- Isometric view of geometrical solids and simple machine parts.
- Conversion of orthographic views into isometric views.
- Construction of Isometric view for any real object. Conversion of orthographic views of simple components into isometric views.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS

Unit No.	Unit	Teaching Hours / Semester
1	Introduction	1
2	Dimensioning techniques & standard conventions	1
3	Engineering Curves & Shapes	4
3	Orthographic projections	13
4	Section of solids	3
5	Development of surfaces	4
6	Isometric projections	2
-	Revision	4
	Total	**32**

5. SUGGESTED LIST OF ACTIVITIES

Following shall be the list of sheets to be prepared as Engineering drawing lab work

Sheet No.	TITLE	Contents	Hours
1.	TYPES OF LINES, LETTERING, DIMENSIONING.	All types of lines, Single stroke vertical capital letters, Methods of Dimensioning-Aligned & unidirectional System, Conventional representation of materials.	4
2.	GEOMETRICAL CONSTRUCTIONS	Construction of Equilateral and Isosceles triangle, Square, Rhombus, Regular pentagon & hexagon	4
3.	ENGINEERING CURVES	Construction of ellipse, parabola, hyperbola by given methods. Involutes, cycloid. Draw normal and Tangent to curves.	8
4.	PROJECTION OF POINTS & LINES	Drawing projection of points in all 4 quadrants. Drawing of projections of lines in following positions (i) Parallel to both Principal planes (ii)Parallel to one and Perpendicular to other Principal plane. (iii) Inclined to one plane and parallel to other plane.	6
5	PROJECTION OF PLANES	Drawing the projection of Triangle square, Rhombus, regular Pentagon when inclined to one principal plane & perpendicular to other plane.	6
6	PROJECTIONS OF SOLIDS	Drawing projection of following solids Cylinder, cone, cube. Right regular solids such as Prism: Triangular & Square,Pyramid: Square & Pentagonal,when axis is inclined to one principal plane & parallel to other principal plane.	8
7	ORTHOGRAPHIC PROJECTIONS	Simple problems on conversion of pictorial into orthographic views.(atleast 2 problems each in 1st angle and 3rd angle)	4
8	SECTIONS OF SOLIDS	Drawing projections and section of solids like square prism, square pyramid, pentagonal 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)	8

9.	DEVELOPMENT OF LATERAL SURFACES	Draw the Development of surfaces for the following right regular solids- Cylinder, Cone, Prism & pyramids (square, triangular, pentagonal).	8
10	ISOMETRIC VIEWS	Conversion of orthographic views of simple components into isometric views.	8

6. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title	Publisher
1.	BIS, India	IS. 696. (Latest revision).	BIS, India
2.	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
3.	R. K. Dhawan	Engineering Drawing & Machine Drawing	Kumar
4.	R.B. Gupta	Engineering Drawing	Satya Prakashan, Delhi
5.	P.S. Gill	Geometrical Drawing	Ketson & Sons
6.	P.S. Gill	Machine Drawing	Ketson & Sons
8.	TTTI, Bhopal	Work Book in Mechanical Drafting	TTTI, Bhopal
9.	T. Jeyapoovan	Engineering Drawing & Graphics Using AutoCAD 2000	Vikas Publishing House Pvt. Ltd, New Delhi.
10	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

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GN 205 ENGINEERING MATERIALS

1. RATIONALE:-

Adequate knowledge of different types of engineering materials, their properties & applications are very essential for the engineers. This course content is designed to provide basic insight knowledge regarding engineering material and their applications which will be useful for the students to learn subjects of higher semesters. The range of materials available for engineering applications is quite vast, hence only the basic groups of ferrous non-ferrous, non-ferrous & other engineering materials with their general properties and uses have been stressed upon.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
G-205	L	T	P	C	TH	TM	TW	PR/OR	
Engineering Materials	4	-	-	4	75	25	-	-	100

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. COURSE CONTENTS

Unit 1 Introduction to Engineering Materials
Classification of Materials
• Metal, Non-metal
• Ferrous Metal & Non-ferrous Metals.
Differences between Metals & non-metals.
Properties of Materials.
• Physical properties – Melting point, freezing point, boiling point, Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity.
• Mechanical properties – Strength, Elasticity, Plasticity ductility,

Malleability, Toughness, Brittleness, Hardness, fatigue, creep.
- Electrical properties – Resistivity, conductivity, Temperature coeff. of resistance, dielectric strength, Thermo electricity, super conductivity.
- Magnetic properties – permeability, coercive force, magnetic stresses.
- Chemical properties - Corrosion resistance, chemical composition, acidity, alkalinity.

Unit 2 Ferrous & Non-Ferrous Metals & its Alloys
➢ **Ferrous alloys.**
o Low carbon steel, medium carbon steel, High carbon steel, their carbon percentage, properties & uses.
o Cast iron – Grey cast iron, white cast iron, spheroidal grey cast iron, their properties & uses.
o Alloy steels.
▪ Constituents of alloy steels such as phosphorous sulphur, Silicon, Manganese and their effect on properties of materials.
▪ Stainless steel, chromium – Nickel steel, Nickel-chromium-molybdenum steel, Nitriding steel, Manganese steel, its properties & uses.
o Tool steel – composition, HSS, High carbon steel, properties & uses.
➢ **Non-ferrous Metals & alloys**

o Aluminium – Properties & uses.
o Aluminium alloys – constituents of alloy & their effect on properties of metal
o Properties & uses of Duralumin, Y-alloy, Al-si alloy, Al-Zn-Mg alloys.
o Copper – Properties & uses.
o Copper alloys – Constituents of alloy & their effect on properties of metal.
o 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.
o Properties & uses of lead & its alloys.

Unit 3 Non – Metallic materials

o Refractory
- Desirable properties.
- Difference between acid, basic & neutral refractories.
- Properties & uses of Fire clay refractory, silica refractory.
o Plastic
- Classification table only.
- Properties & uses of Thermosetting & Thermoplastic.

o Natural & Synthetic abrasive materials.
- Introduction, Properties & uses.
o Rubber
- Properties & uses of natural, neoprene, synthetic & butyl rubber.

- Vulcanization process.
  - Glass
- Properties & uses of soda glass, Borosilicate glass, fibre glass.
- Glass wool – composition, properties & uses.

  - Introduction to composite materials.Classification diagram only.

Unit 4 Conductor, Semi Conductor, Insulating and Magnetic Materials.

- Classification of Materials as conductor, Semiconductor and Insulating materials.
- Conductor Materials.
  - High conductivity materials
    - Copper, Aluminium, Carbon, Silver, Lead, Brass, Bronz, Tungsten & Gold.
    - Their properties as conducting materials and applications.
  - High resistivity materials
    - hichrome, constantan, manganin
    - Their applications
- Insulating materials
  - Introduction
  - Characteristics of Good Insulating materials
  - Solid Insulating materials
    - Wood, paper, rubber, mica, glass tibre, porcelain, varnish, PVC, Resins.
  - Their characteristics as insulating materials and applications.
  - Liquid insulating materials
  - Mineral oil, its properties as insulating material and applications.
  - Gaseous insulating materials like air, Nitrogen, Sulphur hexafloride   & their applications.
- Semiconductor Materials.
  - Silicon & Germanium. Their specifications as semiconductor material and uses
- Magnetic Materials.
    Classification as:
        * Dia Magnetic
        * Para Magnetic
        * Ferromagnetic
        * Non magnetic
List of these materials and their applications.

Unit 5 Construction Materials

-         Building Stones : Classification of rocks, Characteristics of good
    building stones, common building stones & their uses.
- Cement: Chemical composition of port land cement,
    outline of manufacturing process, types of cements, uses.
- Bricks: Bricks – Constituents, properties, classification, special bricks – refractory and flyash bricks; uses.
-        Other materials:
-        Lime   – Sources. Properties, uses.
- Clay   – Different building products from clay   like tiles, pipes etc.
- Timber – Common varieties of timber, uses wood products, veneer, plywood, etc.
- Sand   – Sources: rivers, crushed aggregates, characteristics uses.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Introduction to Engineering Materials	04	09
2	Ferrous & Non-Ferrous Metals & its Alloys	16	18
3	Non – Metallic materials	12	12
4	Conductor, Semi Conductor, Insulating and Magnetic Materials.	16	18
5	Construction Materials	16	18
		64	75

Semester - III

Course code	Name of Course	TEACHING SCHEME in hours				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/OR	TW	
CS301	Engg. Mechanics	3	1	2	6	75	25	-	50	150
CE301	Surveying-I	3		4	7	75	25	25	50	175
CE302	Building Construction	3	1		4	75	25		25	125
CS305	Computer Aided Drafting	-		4	4			50	50	100
CE303	Concrete Technology	3		2	5	75	25	25(O)	25	150
CE304	Transportation Engg. I	4			4	75	25			100
	Total	**16**	**2**	**12**	**30**					**800**

CS 301 ENGINEERING MECHANICS

1. RATIONALE: The focus of the course is to study rigid bodies, subjected to motion or equilibrium with the particular emphasis of engineering applications. This course plays a key role in engineering and is a pre- requisite for all design applications. Basic understanding of the concepts and principles involved in mechanics is essential. The concepts in Applied Mechanics form the base of all engineering disciplines. Applications of principles to engineering situations is emphasized in this course. Considering the level of student, concepts are difficult; hence classroom demonstration should be used to explain concepts and principles.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CS301 ENGINEERING MECHANICS	L	T	P	C	TH	TM	PR /OR	TW	
	3	1	2	6	75	25	-	50	150

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L-Lecture; ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;* ***TH****- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   Force
Definition & units of Force, Types of Forces, its Characteristics, Effect of Forces,
System of Forces, Resolution & Composition of Forces (Resolving along X & Y Axis only).
Relationship between Resultant & Equilibrant Force.
Application of Resolution to find Resultant of coplanar concurrent Force System, and Finding missing force when resultant is given.
Unit 2   Moments
Definition and units, Sign conventions (Take clockwise +ve, Anticlockwise -ve)
Definition & units of couple (clockwise +ve, Anticlockwise -ve)
Characteristics of couple, Varignon's Theorem,
Application of above to find Resultant in magnitude, direction and line of action in Coplanar Non- concurrent and parallel Force system.

Unit 3 **Equilibrium**

Concepts of Equilibrium, Conditions of Equilibrium for Two forces, Three forces, concurrent & non concurrent force system, Lami's Theorem and its application..

Concepts and drawing of Free Body Diagram involving not more than three bodies.

Definition of Beam, types of beams, types of Supports and types of loading.

Application of Equilibrium to beams (Beams with two supports at the ends, Beams with overhangs) with Concentrated loading, UDL, Partially UDL Loading only.

Applications of Equilibrium to determine the forces in the member of the perfect simple support and cantilever truss using method of Joints. Graphical method/ Maxwell diagram for determination of forces in the member of truss.

Unit 4 **Friction**

Definition, Coulombs Law of static friction, coefficient of friction, Angle of friction, Cone of friction, Angle of Repose

Application of Friction with a block on horizontal and inclined Plane , Ladder friction.

Unit 5 **Kinetics**

D'Alembert's Principle and its Application

Simple problems related to Motion of Lift, Two connected bodies with a single string, suspended on horizontal and inclined planes.

Unit 6 **Momentum, Impulse & Impact**

Definition and units of Momentum and Impulse

Definition of impulsive force

Law of Conservation of Momentum.

Simple problems related to Momentum and Impulse, impulsive force, Law of Conservation of Momentum

Unit 7 **Work, Power & Energy**

Definition and units of Work, Power and Energy.

Forms of Energy – Kinetic and Potential Energy.

Principle of Conservation of Energy;

Simple numerical problems to calculate Work, Power, Energy & conservation of Energy

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Force	5	9
2	Moments	4	9
3	Equilibrium	12	18
4	Friction	6	9
5	Kinetics	9	12
6	Momentum, Impact & Impulse	4	6
7	Work, Power & Energy	8	12
		48	75

5. List of Experiments

(A) Any 06 of the following experiments

1. To Verify Polygonal Law of forces.
2. To Prove Lami's Theorem.
3. To find Co-efficient of Friction.(Any Two Surfaces)
4. To Determine Reactions in Beam Apparatus.
5. Four experiments on Lifting Machine to find M.A, V.R , Efficiency, and to obtain Law of Machine.

(A) Graphical Analysis: - 3 sheets (Half Imperial)

1. Determination of Resultant of Coplanar Concurrent Forces.

2. Determination of Resultant of Coplanar, Non-concurrent Forces and Parallel.
3. Analysis of Trusses (Simply supported and Cantilever) using Maxwell diagram.

6. LEARNING REFSOURCES

S.No.	Author	Title of Books	Publication
1	Dadhe, Jamdar, Walavalkar	Fundamental of Applied Mechanics	Sarita Prakashan, Pune
2	R.S. Khurmi	Applied Mechanics	S. Chand & Co. Ltd, New Delhi
3	A.R. Basu	Engineering Mechanics	Tata McGraw Hill Company, New Delhi
4	R.C. Patel & B.M. Patel	Applied Mechanics Vol. I	Acharya Book Depot, Vadodara
5	M N Patel, C S Sanghavi & J S Thakur	Engineering Mechanics	Mahajan Publishing House, Ahmedabad

CE301 SURVEYING I

1. RATIONALE: Surveying is one of the core subjects for civil engineering course wherein principles and method of different types of survey are studied. The course content is designed to: Train the students to study and carry out surveying & levelling operations independently on the field. Develop the ability to apply knowledge to the solution of day to day problems on construction site; to develop the skills in handling various survey instruments.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
SURVEYING -I	L	T	P	C	TH	TM	TW	PR/OR	175
	3	-	4	7	75	25	50	25	

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1   Introduction

Scope of surveying, classification of survey,. general principles of survey

Unit 2   Chain Surveying

Study of 30m chain. Instruments for marking stations, ranging rods, pegs, arrows, cross staves. Ranging-Direct and indirect ranging, chaining on sloping ground. Triangulation, selection of survey stations, baseline; check-line, tie line, taking offsets to locate ground features; Conventional signs on survey maps viz. Cutting, embankment, marshy land, road, railway, stream, river etc. Calculation of areas from recorded observation in chain and cross-staff survey. Errors in chaining, precautions and obstacles in chaining

Unit 3   Compass Surveying

Prismatic compass – Component parts, construction and use. Bearing of a line – Fore bearing and back bearing, whole circle and quadrantal system, reduced bearing, conversion of bearing, finding included angles from bearings; Open and close traversing. Local attraction - Reasons, error due to local-attraction. Correction of bearings affected by local attraction. Simple problems.

Unit 4	Levelling

Definition – Level surface, level line, horizontal line, vertical line, datum surface, reduced level, benchmark & its types – temporary, permanent, GTS benchmark. Dumpy level & its component parts, fundamental axes of dumpy level. Levelling staff – Telescopic type; Terms used in levelling - Fore sight, back sight, Intermediate sight, change point and height of collimation; Classification of levelling - Simple, differential, profile levelling and cross-sectioning, fly levelling. Recording in levelling book-Height of collimation method, rise and fall method, arithmetic checks, problems in H.I. method. Sources of errors, precautions to eliminate the errors.

Unit 5	Plane Table Survey

Principles of plane table survey, accessories required. Setting of Plane table, levelling, centering and orientation. Method of plane table surveying – radiation and intersection, Use of Telescopic alidade. Merits & demerits of plane table survey.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Introduction	2	4
2	Chain Surveying	8	16
3	Compass Surveying	14	22
4	Levelling	20	27
5	Plane Table Survey	4	6
		48	75

5. TERM WORK & PRACTICALS
Practical s shall include following:
1. Study of Chains – 20m, 30m, tapes – metallic, steel , fibre glass, ranging rods, arrows, pegs, cross staff (all with sketches)
2. Direct ranging – measuring a distance on a sloping ground.
3. Reciprocal ranging, ranging & chaining a distance across obstacles.
4. Study of prismatic compass, measurement of bearings and calculation of included angles.
5. Study of dumpy level (Ready made sketch of the instrument to be referred & no drawing of instrument required).
6. Practice on simple levelling & differential levelling
7. Profile levelling and cross levelling – fly levelling & checks.
8. Study of plane table, adjustments. Plane table methods of intersection & radiation.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	N. N. Basak	Surveying and Levelling	McGraw Hill Education (India) Private Limited.
2	B. C. Punmia	Surveying (Volume – I & II)	Laxmi Publication Ltd.
3	S. K. Duggal	Surveying (Volume – I & II)	McGraw Hill Education
4	S. S. Bhavikatti	Surveying and Levelling(Volume – I & II)	I. K. International Publishing House Pvt Ltd.
5	S. V. Kulkarni, T. P. Kanetkar	Surveying and Levelling(Volume – I & II)	Pune Vidyarthi Griha Prakashan, Pune
6	K. R. Arora	Surveying (Volume – I & II)	Standard Publishers Distributors

CE 302 BUILDING CONSTRUCTION

1. RATIONALE: The students are required to know: Construction materials used in different components of buildings, construction methods and sequence of procedures in detail. Sketch and understand detailed drawings of parts of buildings. Students should be able to explain the procedures to workers/mistries on the site with the help of sketches.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
BUILDING	L	T	P	C	TH	TM	TW	PR/OR	125
CONSTRUCTION	3	1	-	4	75	25	25	-	

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

PR/OR - *End Semester Practical / Oral Examinations;* **TW**- *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	**Introduction**

Inspection of site, preparation of double-line plan, elevation, section, foundation plan and centre line plan for a single storeyed building with four rooms, studying working drawing, collecting details such as strata available for foundation, levels of site, preliminaries required to start construction. Measuring instruments, instruments for excavation, materials for setting out, setting out methods

Unit 2	**Foundations**

Introduction to load bearing structure and framed structure. Definition and purpose of foundations. Classification of foundation. Brief idea about bearing capacity, definition, bearing capacity values of different soils, use of bearing - capacity. Empirical design of shallow foundation, spread footing for walls. Different loads coming on foundation and column footings. Combined footing Mat or raft footing .

Unit 3	**Stone Masonry**

Characteristics of good building stones. Common stones used in construction of walls, foundations, cladding. Construction of stone walls and foundations. Terms used such as facing, backing, hearting, headers, stretcher through lapping. Bonds in stone masonry. Types of stone masonry – Un-coursed rubble, coursed rubble, ashlar, random rubble and dry stone masonry. Dressing of stones, joints.

Unit 4   **Brick Masonry**

Requirement/characteristics of good building bricks. Classification of bricks. Terms such as bed, frog, stretcher, header, coarse, bond and its importance. Laying of bricks, soaking, mortar joints, checking the level and plumb, scaffolds, raking of joints, curing, mortar mixes to be used. Features of Flemish bond and English bond and their suitability, other bonds. Half brick thick partition walls, foundations for partitions, reinforcing the brick partition walls with R.C.C. bonds. Opening in brickwork spanned by lintels and arches. Points to be observed in construction of good brickwork.

Unit 5   **Doors and Windows**

Doors- functions, locations, standard sizes, frame sizes, shutters such as battened and edged, battened ledged and braced, panelled, flush, fixing the shutter with frame, opening direction and hinge position, glazed ventilators to doors, other types of doors such as steel, collapsible, rolling, P. V. C., door fixtures, F.R.P.

Windows - Frame sizes, common sizes of windows glazed shutters, sash windows, glazed louvers, top hung, bottom hung & middle pivoted ventilators, Steel & Aluminium windows, grills and fixtures for windows, use of synthetic materials, dormer window, bay windows.

Unit 6   **Roofs**

Pitched and flat roof, suitability and comparison. Terms used in pitched roof such as ridge, eaves, hip, gable, etc. Types of pitched roofs such as lean- to roof, couple, couple closed, collar, king post and queen post trussed roofs, steel trusses.

Roof covering – Mangalore tiles, asbestos cement sheets, G.I. sheets, PVC and FRP sheets and connections, laying procedure. Drainage of pitched roofs.

Unit 7   **Floors and Floor Finishes**

Ground Floors-Requirements of a good floor, plinth filling, rubble packing (soling), base concrete. Upper floors-Single & Double timber floors, R.C.C. floors. Mezzanine.– Location, requirements and uses. Floor finishes- Murrum flooring, I. P. S. flooring, red oxide flooring, Mosaic and Terrazo flooring, granite stone flooring, Shahabad flooring, black Cuddapah flooring, marble flooring, brick flooring, construction details. White and coloured glazed flooring. Skirting and daddoing, P.V.C. (Vitrified), Construction & fixing.

Unit 8   **Stairs**

Function, location, common terms such as pitch, nosing, tread, riser, landing, hand rail, baluster, newel post, soffit, head room. Requirements of a good stair, thumb rules for geometrical design of stair, common dimensions of stair in residential and commercial buildings. Types of stairs based on- Geometrical shape, material: stone/ brick, timber, steel, concrete. Supporting conditions such as simply supported, cantilever. Finishes of nosing, balusters and newel-post, folded.

Unit 9	Finishing Works

Plastering mortar for plastering, preparation of surfaces for plastering, scaffolds for internal & external plaster, methods of plastering. Plaster finishes: Internal surfaces, external surfaces, sand faced plaster, roughcast plaster, pebbledash, wrinkled, neeru finish, precautionary measures to avoid cracks in plaster.

Pointing-Necessity of pointing the stone and brick masonry, flush pointing, raked pointing, weathered pointing, recessed pointing. Painting- Preparation of surface for new and old painting with oil paints, white wash and colour wash, distempering and cement paints.

Concepts of water proofing, termite control and fire proofing.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Introduction	4	6
2	Foundations	8	15
3	Stone Masonry	4	6
4	Brick Masonry	6	9
5	Doors and Windows	6	9
6	Roofs	4	6
7	Floors and Floor Finishes	6	9
8	Stairs	4	6
9	Finishing Works	6	9
		48	75

5. LIST OF PRACTICALS

1. Study of Setting out of building drawn in Chapter 1 above.
2. Study of Construction of brick-work at right angled corner in English bond and in Flemish bond, each one brick thick and 1½ brick thick.
3. Study of Construction of "T" junction in brick work;
4. Study of Form work of R.C.C. beam, slab and columns.
5. Study of Construction of stone masonry wall.
6. Study of different types of Scaffolding for walls.
7. Study of Plaster finishes and procedure.
8. Site visit & report on site visit.
9. Study of model of King post roof truss, queen post, roof-truss with all components.

NOTE: 1. All the above practical are to be compiled in the form of Term Work and to be submitted.
2. In absence of Models, site visits can be arranged.

6. LEARNING RESOURCES

S. No.	Author	Title of Books	Publication
1	Sushil Kumar	Building Construction	Standard Publishers and Distributors, New Delhi
2	B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain	Building Construction	Laxmi Publications, New Delhi
3	S.C. Rangawala	Building Construction	Charotar Publishers, Gujarat
4	S. P. Arora & S P Bindra	A Text Book of Building Construction	Dhanpat Rai Publications, New Delhi

CE 303 CONCRETE TECHNOLOGY

1. RATIONALE: Concrete is the most versatile construction material which can be moulded to any size and shape and possesses special characteristics of high compressive strength, durability, fire resistance, impermeability and homogeneity. The quality of concrete governs the performance of the resulting structure and therefore the knowledge of theory and practice of good concrete making is of vital importance to civil engineers. This course gives students good knowledge of concrete composition, making of good concrete, tests on concrete, mix design and non-destructive testing.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CONCRETE	L	T	P	C	TH	TM	TW	PR/OR	150
TECHNOLOGY	3	-	2	5	75	25	25	25 (O)	

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1	Introduction

General idea of different types of concrete: Lime Concrete, Cement Concrete, R.C.C and Prestressed Concrete.

Unit 2	Concrete

Cement- Physical properties - Specific gravity, Fineness; Chemical composition; Hydration process; Setting and hardening; Compounds of cement.
   Laboratory tests on cement- fineness, consistency, setting time, compressive strength, soundness. Field test on cement; Requirements as per I. S. 269; Storage of cement; Reduction in strength of cement .
Fine Aggregate- Sources; Types of sand, Laboratory test- Specific gravity, sieve analysis, fineness modulus, impurities, bulking of sand and its effects. Field test. Crushed sand.
Coarse Aggregate- Types, Specific gravity, density, sieve analysis, fineness modulus, grading of aggregates. Properties and tests- Flakiness & elongation, Los Angeles abrasion value, crushing value,
Water Quality- Requirements of water suitable for concrete making.

Unit 3	Concrete Making

Different grades of concrete as per IS456 (latest revision). Proportioning of ingredients, volume batching, weight batching, water cement ratio, its importance. Yield of concrete per batch.
Mixing of concrete- Object, types of mixing-hand, machine. Types of mixers, capacity, and ready-mix concrete.
Transporting and placing of concrete, various methods, and precautions to be taken. Segregation, bleeding, concreting under water.
Compaction of concrete- Object of compaction, hand compaction, use of vibrators, advantages, precautions to be taken.

Curing of concrete- Purpose, methods of curing under different situations, steam curing and curing period. Formwork removal and stripping time as per IS-456 (latest revision).

Unit 4   Properties of Concrete

Workability- Necessity, factors affecting, measurement, test, method of improving workability. Strength- Crushing strength, factors affecting. Tests as per I. S. 516, Slump test, Flow test, Compaction factor test.

Unit 5   Admixtures

Necessity and factors, types of admixtures, their uses- accelerators, retarders, air-entraining agents, pore fillers, superplasticizers, hardeners, colouring agents, pigments.

Unit 6   Joints in concrete

Purpose, location and types. Construction joints, contraction and expansion joints. IS Codal Specifications for joints.

Unit 7   Special Types of Concrete

Salient properties, advantages and limitations of following types of concrete- Pre-cast concrete, pre-stressed concrete, ready-mix concrete, ferro-cement concrete, light weight concrete, air-entrained concrete and fibre- reinforced concrete. High Performance Concrete, Self compacting Concrete, foam concrete, engineered cementitious composites

Unit 8   Concrete Mix Design

Objectives of mix design, design methods, nominal mix and design mix both as per latest IS Standards. Codal provisions for concrete for different environmental exposure conditions.
IS Code method of Mix Design, strength and workability requirements, determination of water- cement ratio, coarse and fine aggregate ratio, aggregate cement ratio, concrete mix proportioning.

Unit 9   Non-Destructive Tests

Objectives, Visual inspection, NDT methods- Schmidt Rebound hammer, ultra-sonic methods-Pulse velocity test, Cover test on concrete, Carbonation test.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Introduction	1	3
2	Concrete	9	12
3	Concrete Making	12	18
4	Properties of Concrete	6	6
5	Admixtures	3	6
6	Joints in concrete	4	6
7	Special Types of Concrete	4	9
8	Concrete Mix Design	5	9
9	Non-Destructive Tests	4	6
		48	75

5. LIST OF EXPERIMENTS (Any 12)

1. Fineness of cement;
2. Standard consistency;
3. Setting times - initial, final;
4. Specific gravity of cement
5. Compression test on cement mortar cubes;
6. Soundness test;
7. Impurities in sand;
8. Fineness modulus of fine aggregates;
9. Bulking of sand;
10. Specific gravity of sand.
11. Fineness modulus of coarse aggregate;
12. Specific gravity of coarse aggregates
13. Flakiness and elongation test;
14. Aggregate crushing value;
15. Aggregate impact value;
16. Aggregate abrasion test;
17. Compacting factor test;
18. Concrete slump test;
19. Compression test;
20. Flow test.

6. LEARNING REFSOURCES

S.No.	Author	Title of Books	Publication
1	M. S. Shetty	Concrete Technology (7th Edition, 2009)	S. Chand & Co. Ltd, New Delhi
2	P. D. Kulkarni , R K Ghosh & Y R Phull	A Text book of Concrete Technology	New Age International (P) Limited, Publishers, New Delhi
3	M. Gambhir	Concrete Technology	Tata McGraw Hill Publishing Co Ltd., New Delhi
4	P. D. Kulkarni & L. N. Mittal	Concrete manual: Laboratory testing for quality control of concrete	Dhanpat Rai & Sons, New Delhi
5	A. M. Neville & J J Brooks	Concrete Technology	Pearson Education India

CE 304 TRANSPORTATION ENGINEERING- I

1. RATIONALE: This subject is designed to give sufficient knowledge of construction and maintenance of Highways, Traffic Engineering and Bridges and which are important for the economic development of our country. The course content has been designed in such a way that the students will have the following abilities -Understand the different transport systems, classification, component of each system and their features, have the knowledge of various recommendations and specifications, able to execute the construction work, as per the approved drawings, specification and undertake maintenance works.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	100
TRANSPORTATION ENGINEERING- I	4	-	-	4	75	25	-	-	

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR *- End Semester Practical / Oral Examinations; TW- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	Introduction

Importance of transportation system in the National development - types and salient points of transportation systems – highways, airways, waterways. Classification of roads - according to importance, materials of construction, load carrying capacity and traffic density. Sketches of standard cross-sections of roads in full embankment, full cutting, partly in cutting and partly in embankment for a National/State Highway with all components.

Unit 2	Geometric Design

Definition of the terms used in Highway Engineering such as carriageway, formation width, land width, shoulder, berms, spoil-banks, borrow pits, lead and lift, building line, control line, sub-grade, etc. Geometric design components such as camber, gradients, sight distance and curves – their definition, necessity, types and IRC recommendations; super elevation – definition, purpose and methods of providing super elevation and their values; widening of roads on curves – necessity and their values (Note: No problems shall be expected on the above topics).

Unit 3	WBM Roads and Earth Roads

Construction procedure of earth roads. Soil-stabilisation – necessity and methods of soil stabilization.
Rolling – precautions to be taken.
Cross-section of a W.B.M. road showing different components with dimensions. Materials used, specification with size and grading with aggregate. Construction procedure. Defects in W.B.M. roads and their maintenance.

Unit 4	Bituminous Roads

Definition of terms- Asphalt, emulsion, cut back, tar – their common grades adopted for construction of roads. Types of bituminous surfaces – Prime coat, tack coat and seal coat. Types of Bituminous surfaces, their construction procedure and brief material specification – surface

dressing, semi-grout and full grout macadam, bituminous/tar carpet, bituminous concrete. Defects and maintenance of bituminous roads.

Unit 5	Cement Concrete Roads

Objectives and functions of pavements, types of pavements, merits and demerits. Comparison between asphalt and concrete roads, their advantages and disadvantages. Concrete road construction – continuous bay and alternate bay method, different stages involved in the construction of concrete roads in brief. Joints in concrete pavements – transverse, expansion, contraction type; necessity of joints, sealing of joints. Defects and maintenance of concrete roads.

Unit 6	Hill Roads

Basic principles of geometric design for hill roads in respect of sight distance, overtaking distance, passing places, hair-pin bends. Cross-sectional features for hill roads such as protective works, retaining walls, catch water drains. Maintenance and special repairs of hill roads.

Unit 7	Drainage

Surface and sub-surface drainage with side gutters, catch drains, longitudinal drains, cross drain. Arboriculture – purpose of planting road side trees.

Unit 8	Traffic Engineering

Definition and Scope; Traffic Characteristic – Road user characteristic and vehicular characteristic (in brief)Traffic studies – Traffic volume study, speed study, O & D study, Traffic flow characteristics, Traffic capacity study, Parking study, Accident studies. Traffic Signs – Regulatory signs, warning signs, Informatory signs.Traffic Signs – Types.

Unit 9	Bridges, Culverts and Causeways

Sketches showing the different components, functions of each component in a bridge.
Difference between bridge and culvert
Classification of bridges based on function, size, materials used, alignment and loading Brief idea and sketches about types of bridges such as RCC and steel, pre-stressed concrete, balanced cantilever, suspension and steel trussed bridges
Bearings, Joints in bridges: Types.
Culverts and Causeways – types and their location.
Bridge Construction Techniques - Fully supported on staging, partly supported on staging. Cantilever construction. Arch rib constructed with cable supports. Continuous deck construction with movable forms. Incremental push launching method. Form-work and false work. Flyover – Clover leaf, etc. – uses.
Definition – Afflux, Scour, Freeboard, Cut water, Case water, etc.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Introduction	6	6
2	Geometric Design	8	6
3	WBM Roads and Earth Roads	6	9
4	. Bituminous Roads	8	6
5	Cement Concrete Roads	6	12
6	Hill Roads	4	6
7	Drainage	3	6
8	Traffic Engineering	3	4
9	Bridges & Culverts	20	20
		64	75

5. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	N L Arora	A text Book of Transportation Engineering	IPH Publications, New Delhi
2	Vazirani & Chandola	Transportation Engineering Vol. I & Vol. II	Khanna Publishers, New Delhi
3	Khanna & Justo	Highway Engineering	Nemchand & Brothers, Roorkee
4	T D Ahuja	Roads, Railways, Bridges & Tunnel Engineering	Standard Publishers & Distributors, New Delhi
5	Ahuja & Birdie	Roads, Railways & Bridges	Standard Book House, New delhi
6	Kamala	Transportation Engineering	Tata McGraw Hill Publishing Company Limited, New Delhi

(CS 305) COMPUTER AIDED DRAFTING

1. RATIONALE:

The market driven economy 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 student so that they can generate various digital drawing s as required using various CAD software.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CS305 Computer Aided Drafting	L	T	P	C	TH	TM	TW	PR/OR	100
			4	4	-	-	50	50(P)	

3. COURSE CONTENTS:

1. Introduction and CAD Preliminaries.   2 hours

    *   Computer aided drafting concept.

    *   Hardware and various CAD software available.

    *   Components of a CAD software window such as Titlebar, Standard toolbar, Menu bar, Object properties toolbar, draw tool bar, Modify toolbar, Cursor cross hair, Command window, status bar, Drawing area,UCS icon.

    *   File features: New file, Saving the file, Opening an existing drawing file, Creating Templates, Import and Export of file, Quit.

- Setting up new drawing : Units, Limits, Grid, Snap.
- Undoing and Redoing action.

2.	Drawing using CAD software: 10 hours

- Drawing basic objects : Point, Line, Circle, Arc, Ellipse, Parabolas, polygon, Rectangle, Multiline, Doughnut, Drawing with precision, Drawing construction lines and rays, Calculating distance and angle, Use of measure, Divide, Inquiry commands, redraws and Regenerating screen display.
- Methods of specifying points, Absolute coordinates, Relative Cartesian, and Polar coordinates.
- Using Object snap: Endpoint, midpoint, Intersection, Centre Point, Quadrant point, Nearest Perpendicular, Apparent Intersection, etc.

3.	Edit/modify features and viewing drawings. 10 hours

- Object Selection : selection set with its options like Pick box, Window, Crossing, Previous, Last drawing, etc.
- Editing Commands like : Zoom all, Zoom Previous, Zoom Extents, Zoom window, Zoom real time, Zoom Dynamic, Zoom Pan.
- Modify commands: Erase, Copy, Mirror, Offset, Array, Move, Scale, Stretch, Lengthen, Trim, Extend, rotate, break, join, chamfer, fillet.

4.	Org

anising Drawing: 6 hours

- Concepts of layers: creating layers, naming layers. making layers ON/OFF, freeze-thaw layers, lock/unlock layers, setting the properties of layers like colour, line type, line weight.
- Concept of blocks : Creating, inserting, redefining and exploding blocks.
- Concept of Hatch: Selecting hatch pattern, Hatch styles, Hatch Orientation, associative hatch, Boundary hatch, Hatching Object.
- Polylines: Drawing polylines, editing polylines, drawing spline curves, editing splines.

5.	Dimensioning and Tolerancing	8 hours

- Dimensioning : Types of dimensioning, Linear, Horizontal, Vertical, Aligned, rotated, Baseline, continuous, diameter, radius, angular dimension, Leader.
- Dimension scale variable,adding geometric tolerances
- Editing dimensions
- Single line text,Multiline text.
- Text styles: selecting font, size, arrows, alignment, etc.

6.	3D-features	2 hours

- Right hand rule/local global co-ordinate system.
- Specifying 3D coordinates
- Using UCS
- Defining user coordinate system using UCS command with its options.
- Viewing in 3D

7.	Isometric Drawing:	10 hours

- Settings for isometric drawing, isometric Snap mode, switching between isometric planes, isocircles, simple isometric drawings

8.	Solid Modeling	12

hours	
• Co ncept of solid modeling	
• Cre ating predefined solid primitives such as box, cone, cylinder, sphere, torus, wedge.	
• Co nstructing a region, creating an extruded solid, creating a revolved solid.	
• Cre ating composite solids using union, intersection and interface commands.	
9. Mo del space, Paper space, viewports and layouts hours	Mo 2
• Co ncept of model space and paper space.	
• Cre ating viewports in model space and creating floating viewport in paper space.	
• Shi fting from model space to paper space and vice versa.	
10. Pri nting/ Plotting drawing. hours	Pri 2
• Sta ndard sizes of sheet.	
• Selecting various plotting parameters such as paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview.	

4. PRACTICALS

1. Drafting of common template for all the following assignments with Institute logo and standard title block.

2. Five problems on different geometrical shapes.

3. Dimensioning of above figures.

4. Three problems with polar and rectangular arrays.

5. Three problems on 2D entity generation, which involve the use of layers and blocks.

6. Two problems on orthographic views for various Engineering drawing objects covering dimensioning, text, etc.

7. Two problem on isometric drawing of Engineering drawing object.

8. Create at least two solid models, which cover all the features available in solid modeling.

9. Drafting project:

    a) Civil Engineering. & Architectural Engineering: Plan, elevation and section of a single story residential building.

    b) Electrical & Electronics Engineering.: Electrical layout of components like bulbs, fan, A.C., T.V. point, telephone point, etc. for a single story house.

    c) Mechanical Engineering.: Industrial components such as machines, automobiles , jigs and fixtures with dimensioning, tolerancing ,text, title block, etc.

    d) Shipbuilding Engineering.: Body plan of a ship.

    e) Mining Engineering.: Plan and section of an opencast mine benches, Plan and section of an underground mine.

    f) F.T.E.E. : Front View and Bottom View of a Simple truss like Saw Tooth truss, King-Post truss, Snow Tooth truss. (Any one of the three)

5. LEARNING RESOURCES

1. AutoCAD for Engineering drawing made easy – P. Nageshwar Rao- Tata McGraw Hill.

2. Mastering AutoCAD – George Omura- BPB Publication.

3. AutoCAD 2004 – Sham Tickoo- Galgotia Publications, New Delhi.

4. AutoCAD 2000 – Devid Frey- BPB Publication.

5. An Introduction to AutoCAD 2000 – A. Yarwood- Longman publication.

6. Using AutoCAD 2000 – Ron House – Prentice Hall.

7. Latest AutoCAD Manual – Autodesk Inc. – Autocad Inc.

8. CATIA V6 Essentials by Jones & Bartlett learning.

9. Inside Catia by Paul Carman, Paul Tigwell.

10. CATIA Tutorials by Nader G. Zamani.

ProE/Creoelements or any equivalent reference/text books.

Semester - IV

Course code	Name of Course	TEACHING SCHEME in hours				EXAMINATION SCHEME				Total marks
						Theory Marks		Practical Marks		
		L	T	P	C	TH	T M	PR/ OR	TW	
CE401	Surveying-II	3		4	7	75	25	25	50	175
CE402	Materials & Structures	4		2	6	75	25		25	125
CE403	Civil Engineering Drawing	2		4	6	75	25	25	50	175
CE404	Public Health Engg.	4		2	6	75	25		25	125
CE405	Hydraulics	3		2	5	75	25		25	125
CS602	Business Communication	-		2	2			50	50	100
Total		**18**		**14**	**32**	**375**	**125**	**100**	**225**	**825**

CE401 SURVEYING –II

1. RATIONALE: The course content has been designed to- Enable the students to acquire skills in handling theodolite in day to day survey work. Use the plane table and its accessories. Provide the student the knowledge of tacheometric survey.

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2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE401 SURVEYING -II	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	4	7	75	25	50	25	175

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L-Lecture; ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;* ***TH****- End Semester Theory;* ***TM*** *– Test Marks*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW****- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   Theodolite
Parts of theodolite and their functions; Temporary adjustments. Swinging the telescope, transiting the telescope, face-left, face-right observation. Measurement of horizontal angles by repetition and reiteration method. Measurement of deflection angle. Measurement of magnetic bearing of a line by a Theodolite. Measurement of vertical angle. Prolonging of straight line – Sources of errors in theodolite work. Permanent adjustments of a transit theodolite. Traversing with a theodolite - Method of included angles, locating details, checks in closed traverse, calculation of bearings from angles. Traverse computation – Latitude, departure, consecutive co-ordinates, errors of closure, distribution of angular error, balancing the traverse by Bowditch's rule, transit rule, and Gale's traverse table. Simple problems on above topic. Study, purpose and use of digital theodolite. & use of Total Station instrument.
Unit 2   Tacheometric Survey
Principles of tachometric survey. Use of Theodolite as tacheometry with vertical staff and fixed hair system. Horizontal sight only. Determination of tachometric constants. Simple numerical problems on above**.**
Unit 3   Contouring
Definition of contour, contour interval horizontal equivalent; Uses of contouring, characteristics of contour lines, direct and indirect methods of contouring, interpolation of contours and establishing grade contours.

Unit 4   **Curves**

Types of curves used in road and rail alignments. Notation for simple circular curve and corresponding calculations. Methods of setting out curves by offset from long chord method, Rankine's tangential angle. Commonly used radii and degree of curves for roads and railways.

Unit 5   **Modern Surveying Instruments**

Definition ,Principles, and applications ,
 i) Digital Level
 ii) Digital planimeter
iii) E.D.M
iv) Total stations
 v) GPS and DGPS

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Theodolite	18	25
2	Tacheometric Survey	8	15
3	Contouring	8	15
4	Curves	8	12
5	Modern Surveying Instruments	6	8
		48	75

5. PRACTICALS

  i.   Contouring by direct method.
  ii.   Contouring by indirect method.
  iii. Study of parts of theodolite, temporary adjustments. Practice of reading   Vernier /or Micrometer.
  iv.   Measurement of horizontal angles by repetition method. Measurement of vertical angles. Measurement of deflection angles. Observation of magnetic bearing. v) Prolonging a line. Locating a contour by using theodolite as tacheometer.
  v.   Setting out simple curves by offsets from long chord. Setting out simple curve by Rankine's method.
  vi.   Simple experiments on profile levelling using Total Station.

TERM WORK

Drawing on an imperial or near metric size sheet finished in pencil on any two of the following project-works- Contouring by indirect method- suitable area, Theodolite traverse for a minimum 5 sided plot, computation by Gale's traverse, Plane table survey of minimum 5 sided traverse by method of intersection.

The term work shall include appropriate field book / level book containing various observations taken at the time of field-work.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	N. N. Basak	Surveying and Levelling	McGraw Hill Education (India) Private Limited, New Delhi
2	B. C. Punmia	Surveying (Volume – I & II)	Laxmi Publication Ltd., New Delhi
3	S. K. Duggal	Surveying (Volume – I & II)	McGraw Hill Education, New Delhi
4	S. S. Bhavikatti	Surveying and Levelling(Volume – I & II)	I. K. International Publishing House Pvt Ltd.
5	S. V. Kulkarni, T. P. Kanetkar	Surveying and Levelling(Volume – I & II)	Pune Vidyarthi Griha Prakashan, Pune
6	K. R. Arora	Surveying (Volume – I & II)	Standard Publishers Distributors, New Delhi

CE 402 MATERIALS AND STRUCTURES

1. RATIONALE: 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 centroid, centre of gravity and Moment of Inertia of sections is included which is pre-requisite to determining bending and shear stresses in structural components. The knowledge of the relationship between the applied loading and the resulting effects in the structural components shall assist in the realistic analysis leading to safe and economic design of structures. The laboratory exercises have been designed to study the properties of the basic structural materials and their behaviour under different types and stages of loading which is of vital importance to a successful Civil Engineer.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	125
CE402 MATERIALS AND STRUCTURES	4	-	2	6	75	25	25		

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L*-Lecture;* ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;*   ***TH****- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;*   ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	Stresses and Strains

Definition of rigid, elastic and plastic bodies, deformation, internal resistance, stress and strain. Axial Loading- Tension, Compression, tensile and compressive stresses and strains, stress distribution. Stress- Strain relationship, Hooke's Law, Modulus of elasticity. Concept of shear loading and deformation, shear stress, shear strain, modulus of rigidity.
Longitudinal strain, lateral strain, Poisson's ratio, Concept of Biaxial and Triaxial stress (No derivations & Numerical Problems),Volumetric strain, Bulk Modulus, relation between modulus of rigidity and Young's Modulus. Stresses and strains in composite sections subjected to axial loading. Temperature stresses and strains in homogenous section.

Unit 2	Strain Energy

Concept and definition of strain energy. Strain energy stored due to gradual, sudden and impact loading, Proof resilience and modulus of resilience.

Unit 3	Centroid, Centre of Gravity & Moment of Inertia

Definition of Centroid, Determination of Centroid of plane regular lamina, cut-outs and built-up lamina. Definition of Centre of Gravity. Determination of Centre of Gravity of filled regular solids, solids with holes and built-up filled solids. Concept of Moment of Inertia, Parallel axis theorem and Perpendicular axis theorem, Polar Moment of Inertia, Radius of Gyration. Moment of Inertia of rectangular, circular and triangular section.(No Derivation). MI of sections –Angle section, I section, Channel, Tee section and built up section with and without flange plates.

Unit 4	Shear Force and Bending Moment

Definition of beam. Types of beams- Cantilever, Simply Supported, Simply Supported with overhang, Fixed and continuous. Types of Loading- UDL, Point Load and Equivalent load. Definition of shear force and bending moment, sign convention. S.F.D. & B.M.D. for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads and moments determining point of contra flexure.
(Analytical & graphical method, No problems on graphical method in theory paper)

Unit 5	Bending Stresses in Beams

Theory of simple bending, definition of pure bending, Neutral plane, neutral-axis, bending plane and bending axis, stress and strain due to bending. Section modulus for rectangular, circular and Symmetrical I section. Assumptions made in theory of simple bending, The bending equation and its use, concept of moment of resistance, bending stress diagrams. Flexural rigidity, beam of maximum strength and beam of uniform strength, Calculation of maximum bending stress in beams of rectangular, circular, I and T section, Permissible bending stress .

Unit 6	Shear Stress in Beams

Shear stress equation, Meaning of the terms in the equation, Shear stress distribution for rectangular section, hollow rectangular section, circular section, symmetrical I section and Tee section. Relation between maximum and average shear stress.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Stresses and strains	16	15
2	Strain Energy	8	6
3	Centroid, Centre of Gravity & Moment of Inertia	12	15
4	Shear Force and Bending Moment	12	15
5	Bending Stresses in Beams	8	12
6	Shear Stress in Beams	8	12
		64	75

5. LIST OF EXPERIMENTS

(A) 1. Tension test on mild steel
2. Compression test on concrete, timber & brick.
3. Charpy test & Izod Test
4. Brinell hardness test & Rockwell hardness test
5. Shear test on mild steel specimen
6. Bend test

(B) Four Half Imperial Drawing Sheets on:
1. Graphical solution of problems on Shear Force and Bending Moment diagrams, for simply supported, cantilevers, and overhanging beams subjected to point loads and
uniformly distributed with analytical calculations.

6. LEARNING REFSOURCES

S.No.	Author	Title of Books	Publication
1	S. B. Junnarkar	Mechanics of Structures volume – I	Charotar Publishing House, Anand, Gujarat
2	S. Ramamrutham	Strength of Materials	Dhanpat Rai & Sons, New Delhi
3	R. S. Khurmi	Strength of Materials	S Chand Publishers, New Delhi
4	Vazirani and Ratwani	Analysis of Structures	Khanna Publishers , New Delhi
5	M. Chakraborty	Strength of Materials	S K Kataria & Sons, New Delhi
6	S S Bhavikatti	Strength of Materials	Vikas Publishing House Pvt. Ltd., Noida (UP)

CE 403 CIVIL ENGINEERING DRAWING

1. RATIONALE: The course content is designed to enable the students to understand the principles of planning of residential and public buildings and to prepare working drawings for residential and public buildings. Students shall also acquire knowledge of various agencies in building Industry and their functions.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	C	TH	TM	TW	PR/OR	175
CE403 CIVIL ENGINEERING DRAWING	2	-	4	6	75	25	50	25	

Minimum passing %: Theory 40% *Duration of theory paper: 4 Hrs.*

Legends:

L-Lecture; ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;* ***TH****- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	Principles of Planning of Buildings

Principles of planning residential and public buildings, 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. Building by-laws of plan sanctioning authority in respect of- Plot area (size), set backs 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. Planning of residential buildings with examples. Planning of public buildings. Following bye-laws for minimum number of toilets, urinals, passage widths, stairs etc. with examples. Requirements of different public buildings such as library, community hall, post-office, commercial complexes, school, hotels, hostels, etc.

Unit 2	Working Drawing

Plan, elevation, sectional views, site plan and foundation plan, area-statement, measured drawing, Principles of sub-division of plots.

Unit 3	Building Industry & Plan sanctioning

Different agencies such as architects, service consultants (for electric fittings), sanitary, structural designers, contractors, suppliers, specialist in building services and role of each. Special services in building construction such as water proofing, termite proofing, soil stabilising and pile driving agencies. Air conditioning, acoustical treatments, etc.
Plan sanctioning authorities- Panchayat, Municipality, Town planning, Planning and Development Authority. Procedure for submitting plans for approval, sanctioning authorities, number of copies, enclosures of plans, important documents, sales and other details.

Unit 4	Drawing of residential & Public building

Design of residential bungalow (G+1 only) - Plan, elevation, section
Design of Public buildings- library, community hall, post-office, commercial complexes, health centres, school, hotels, hostels, etc (Line plans only)

Unit 5	Introduction to Perspective Views

One point and two point perspective.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY & Practicals)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Principles of Planning of Buildings	6	10
2	Working Drawing	4	-
3	Building Industry & Plan sanctioning	4	10
4	Drawing of residential & Public building	6	-
5	Introduction to Perspective Views	4	-
	Planning & Drawing of Residential Building		40
	Planning & Drawing of Public Building		15
		24	75

5. TERM WORK

LIST OF PRACTICALS

(A) A sketch book containing the sketches of the following-

1. Line plans of the residential buildings with different combinations like two rooms, four rooms
   etc.
2. Detailed and enlarged sketches of internal units of the building like-Kitchen, Bedroom, Toilet,
   W. C. and Bath.
3. Plans of different types of stairs showing all the components including the supporting structure, Design and drawing of plan and sectional view of dog-legged stair with detailed dimensions. (No R.C.C. design).

(B) Drawing sheets on the following -

1. Planning and designing a residential building 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. Note: Minimum two sections to be taken - One section through stair case, another section through Bath and W.C.
2. Dimensioned Line plans of a public building –any five
3. Sub-division of plots
4. Two point perspective of single storeyed residential building.

6. LEARNING REFSOURCES

S.No.	Author	Title of Books	Publication
1	D. M. Mahajan	Elements of Building Drawing	Pune Vidyarthi Griha Prakashan, Pune
2	Kale,Shah & Patki	Building Drawing with Integrated Approach to Built Environment - 5th edition	Tata McGraw - Hill Education
3	R. S. Malik	Civil Engineering Drawing	New Age Publishing House, New Delhi
4	V. B. Sikka	A Course in Civil Engineering Drawing	S K Kataria and Sons, New Delhi
5	M Chakraborti	Civil Engineering Drawing including Architectural Aspect	M Chakraborty

CE404 PUBLIC HEALTH ENGINEERING

1. **RATIONALE:** 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.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
					TH	TM	TW	PR/OR	
CE404 PUBLIC HEALTH ENGINEERING	L	T	P	C	TH	TM	TW	PR/OR	125
	4	-	2	6	75	25	25		

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; **TW**- Term Work

3. DETAILED COURSE CONTENTS

Unit 1	**General**

Public health- Sanitation, hygiene and pollution. Role of public health engineer. Importance of environment protection.

Unit 2	**Sources of Water**

Surface water and ground water resources. Factors controlling the selection of sources. A brief idea of rural and urban water supply schemes.

Unit 3	**Water Quality**

Requirements of wholesome water. Necessity of treatment and aims of purification. Precaution against water borne diseases. Physical, chemical and biological requirements. Common important parameters to understand water quality. (Detailed procedures for conducting tests not expected). Permissible limits of impurities as per I. S. 2296 : 1982.

Unit 4	**Water Demand**

Quantity of water for domestic. Industrial and public use. Estimation of water demand. Variation of demand-Monthly, daily and hourly variations. Losses and wastage. Methods of population forecast (No problems)

Unit 5	**Water Treatment**

(No designs and problems) [Only overview of treatment expected]. Flow diagrams of a water treatment plant, necessity of various units of treatment-principles, function and use of each. Aeration of water, purpose methods. Flocculation and sedimentation - Coagulation-

common coagulants used, clari-floculators, sludge removal, detention period. Filtration- Types of filters, description of rapid sand and filters, their advantages and disadvantages. suitability. Dis-infection - Chlorination, different methods of application, action of chlorine, breakpoint chlorination, residual chlorine, de-chlorination, introduction to other methods of dis-infection- ozonation, ultraviolet rays.

Unit 6	Distribution of Water

Methods of distribution- Description of tree, circular and radial layout of network
 (No designs). Service reservoirs- Ground level, elevated type, purpose and requirements. Systems of supply: continuous and intermittent, advantages and disadvantages. Types of pipes, laying, jointing and testing of pipes.
Appurtenances- Gate valves, check valves, air- relief valves, non-return valves, fire hydrants, location and use of each.

Unit 7	Plumbing

House service connections from the street mains. Detailed of internal distribution of water supply in a building, with position of all specials and appurtenances. Details of plumbing, types of pipes and fittings.

Unit 8	Sewage

Sewage- General considerations and characteristics, definition of sewage, sullage domestic sewage, industrial sewage, septic sewage, dry weather flow. Water carriage system, principles of working, advantages and disadvantages, self -cleansing velocity and gradient, maximum and minimum velocities. Factors affecting size of sewer materials. General layout of sewers [no design]- Lateral, sub-main, main, trunk sewer, interception and out-fall sewer. Manholes-Location and function, sewer ventilation: necessity and methods.

Unit 9	Sewage Treatment

[No designs and problems]   [Only overview of treatment expected]. Flow diagram of a sewage treatment plant, necessity of primary, secondary and tertiary treatment, objectives of sewage treatment. Introduction to distinguish between aerobic and anaerobic decomposition, B.O.D. and C.O.D. Definition and relevance. Necessity of various units of treatment- Principle, functions and use of each-clarifiers, detritus tank, trickling filter, sludge digesters, sludge drying beds, introduction to activated sludge process, effluent discharge.

Unit 10	House Drainage & Sanitation

General principles of house drainage. Details of sanitary plumbing- Single stack system, double stack system, types of pipes and fittings. Different types of traps- Location and function, inspection chambers. Details of internal connections in a building, position of all specials and fittings. Septic tank and soak-pit- Location, functioning and design criteria, use of standard tables for design.

Unit 11	Solid Waste Management

Dry refuse, rubbish, garbage, definitions and common constituents. Brief idea of collection and disposal methods of dry refuse.
Overview of the latest technologies in sewage treatment – Sewage treatment for housing complexes, SBR, MBBR, OWC
Municipal solid waste landfills – overview.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	General	2	3
2	Sources of Water	3	3
3	Water Quality	5	6
4	Water Demand	5	6
5	Water Treatment	8	9
6	Distribution of water	6	6
7	Plumbing	6	6
8	Sewage	8	9
9	Sewage Treatment	8	9
10	House drainage & Sanitation	8	9
11	Solid Waste Management	5	9
		64	75

5. LIST OF EXPERIMENTS

(B) **Any four tests on water or waste :**
pH, uspended solids, turbidity, residual chlorine, dissolved oxygen, B.O.D., colour test,
jar test.

(B) **Five half imperial size drawing sheets on:**
1. Study of water treatment process including drawing of flowcharts.
2. Study of sewage treatment process including drawing of flowcharts.
3. Design and drawing of a septic-tank, soak pit.
4. Detailed drawings of water supply and sanitary plumbing systems for a two storeyed
residential buildings.
5. Study on use of nomograms based on Hazen William formula and Manning`s formula
– problem solving exercise to illustrate use of nomograms.

(C) **Visit to water treatment and sewage treatment plant.**

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	Santosh Kumar Garg	Water Supply Engineering	Khanna Publishers , New Delhi
2	Santosh Kumar Garg	Sewage Treatment & Sewerage	Khanna Publishers , New Delhi
3	S.C. Rangawala	Water Supply & Sanitary Engineering	Charotar Publishing House, Anand, Gujarat
4	G.S. Birdi	Water Supply & Sanitary Engineering	Dhanpat Rai & Sons, New Delhi
5	Kamala & Rao	Environmental Engineering	Vikas Publishing House Pvt. Ltd., Noida (UP)

CE 405 HYDRAULICS

1. RATIONALE: 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 works related to Irrigation, Environmental Engineering system and Transportation Engineering system.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
CE405 HYDRAULICS	3	-	2	5	75	25	25	-	125

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:

L *-Lecture;* ***T*** *- Tutorial;* ***P*** *- Practical;* ***C*** *- Credit;* ***TH*** *- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	Introduction

Definition and classification of fluids. Branches of hydraulic - Hydraulics and Hydrodynamics. Fluid properties – Density, specific gravity, specific weight, viscosity, surface tension, capillarity and compressibility.

Unit 2	Hydrostatics

Liquid pressure, pressure head. Atmospheric pressure, Absolute pressure, Gauge pressure. Pressure measuring devices- Manometers-principle and working of Piezometer tube, simple 'U' tube, differential 'U' tube, and inverted 'U' tube manometers. Mechanical gauges- Bourdes pressure gauge-It's working principle. Pressure on plane surfaces immersed in liquid, total pressure, centre of pressure-pressure diagrams.

Unit 3	Hydrodynamics

Types of flow- Steady, unsteady, uniform, non-uniform, laminar and turbulent flow, compressible and incompressible flow. Discharge principles of continuity, energies of liquid, pressure head, datum head and velocity head. Total energy of liquid, Bernoullis theorem, pitot tube and venturimeter.

Unit 4	Orifices & Mouthpieces

Flow through orifices and mouthpieces: -Definition of an orifice, types, Vena-contracta. Hydraulic coefficients C_o, C_v & C_d discharge through an orifice. Mouth-pieces-types-external, convergent, divergent, Borda's mouth piece and calculation of discharge (No numerical problems on mouthpieces)

Unit 5	Notches & Weirs

Definition- Types of notches – Rectangular, 'V' & trapezoidal discharges over notches. Discharge over a weir, end contraction, velocity of approach, Francis & Bazier's formula.

Unit 6	Flow Though Pipes

Flow through pipes - Laws of fluid friction, Reynold's number, it significance. Various losses in pipe flow- Major and minor, friction loss, loss of head due to entrance, sudden enlargement, sudden contraction, obstruction line and total energy line. Hydraulic gradient line and total energy line. Flow through pipes in series and parallel, compound pipe and equivalent pipe. Water hammer – Causes, effect and remedial measure. (No derivation required). Use of nomogram in the distribution system.

Unit 7	Flow Though Open Channels

Flow through open channel- Types of channel flow, different shapes of artificial channels, rectangular, trapezoidal. Wetted perimeter, Hydraulic Mean Depth. Most economic section of channel for Rectangular and Trapezoidal. Hydraulicjump-significance and application.

Unit 8	Hydraulic Machines

(Principles of working, No mathematical treatment required). Introduction, Centrifugal pump, Reciprocating Pump, Power required to drive the pump and selection of pump.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Introduction	2	3
2	Hydrostatics	12	18
3	Hydrodynamics	6	9
4	Orifices & Mouthpieces	4	9
5	Notches & Weirs	4	6
6	Flow though Pipes	6	9
7	Flow through Open channel	8	12
8	Hydraulic Machines	6	9
		48	75

5. LIST OF EXPERIMENTS

1. Verification of Bernoulli`s Theorem,
2. Determination of coefficient of Venturimeter and Orificemeter,
3. Determination of Hydraulic coefficients for circular orifice,
4. Determination of coefficient of discharge for Rectangular Notch, 'V- notch and Trapezoidal notch.
5. Determination of coefficient of friction for flow through pipes,
6. Study of simple Hydraulic Machines (Centrifugal & Reciprocating pumps)

6. LEARNING REFSOURCES

S.No.	Author	Title of Books	Publication
1	R K Bansal	**A Textbook of Fluid Mechanics and Hydraulic Machines**: (in S.I. Units)	Laxmi Publications Pvt. Ltd., New Delhi
2	R.K. Rajput	A Textbook of Fluid Mechanics and Hydraulic Machines in S.I. Units	S. Chand & Co. Ltd, New Delhi
3	R.S. Khurmi	Hydraulic and Hydraulic Machines	S. Chand & Co. Ltd, New Delhi
4	Jagdish Lal	Fluid Mechanics and Hydraulics (in SI & MKS Units)	Metropolitan Book Company Ltd., New Delhi

(CS602) BUSINESS COMMUNICATION

1. RATIONAL :

The course on Business Communication will help in development of speaking, listening, writing, and reading skills in students, with special reference to business environment like writing business letters, notes, reports, documents, holding meetings and discussions, working in groups, etc. . Special provision has been made for language workshops where the communication skills of the students can be enhanced.

2. Teaching and Examination Scheme :

Course Code & Course title	Periods per week in hours			Total credits	Examination scheme				
					Theory Marks		Practical Marks		TOTAL Marks
	L	T	P	C	TH	TM	PR/OR	TW	
(CS602) Business Communication	-	-	2	2	-	-	50	50	100

3. Competences to be developed through this course :

The course content should be taught and implemented with the aim to develop different type of skills leading to the achievement of the competency "Communicate effectively in given Business situations".

4. Detailed Course Content :

Unit 1.1: Communication Skills in the work place Communication within the organizational, Types of communication, functions of Internal & external communications Definition, components, importance of effective communication skills, types-verbal-non verbal, methods and hints to improve communication skills, body language, Précis and comprehension
Unit 1.2: Modern Office technology for communications: Using technology and internet to **obtain** information about suppliers, their credibility, latest specification of items, contacting people, quick feedback, social networking, skype, whatsapp, spell check, **dissemination** of information, send email to staff, paperless office, etc
Unit 2.1: Seminars Objectives, topic selection, audience, structure, tips for good beginning and end, aids to presentation.
Unit 2.2: Project work: A link between the theory and the practical Tips: Narrow down to the topic, specific not vague, data collection, structure, critical thinking and analysis.

Unit 3.1 : Report writing: Understanding Objective and Subjective report writing (i)Feasibility report: Definition, types, economic feasibility, technical feasibility, definition. (ii) Trouble Report: Purpose, instances when trouble reports are written, procedure followed in writing trouble report (iii) Formal Reports: Essay, Pamphlet, Booklet or Book report, Parts of a book Report, understanding how to write formal reports
Unit 3.2 : Illustrations in a report: Uses, types, Use of illustrations: Tables, graphs, charts, Venn diagram, organizational charts, flow charts, maps, photographs, drawings and diagrams.
Unit 4.1: Topic -Letter writing: Credit letter, Collection and sales letters
Unit 4.2: Memorandum: Definition, difference from letter, examples of memorandum
Unit 5.1: Meetings: Preparation, Notice for the meetings, Agenda
Unit 5.2.: Note taking during meetings, minutes of meeting
Unit 6.1: Tender: Procedure, Preparation, Types of tenders, Single tender, local tender, e tender, Structure, Tender Notice, Terms and conditions, Payment details, specification, Documents to be submitted, placing orders, Evaluations, drafting advertisements for tenders
Unit 7: Job Interviews: Preparing for a Job Interview, guidelines on facing job interviews, ways of scouting for jobs, Writing Job Application, resume,

Marking scheme :

Term Work   **Maximum marks**

Overall classroom performance...10

Workbook (assignments)............ 25

Classroom activity (language workshop)............ 15

Term End Assessment

Components   **Maximum marks**

Questions on syllabus...............................20

Activity...30

4. **Suggested specification table with hours and marks (Practical) :**

Unit No	Topic	Teaching hours per semester
1.	Communication Skills in the work place	04
2.	Organizing seminars, project work	04
3.	Report writing	05
4.	Letter Writing	05
5.	Meeting	05
6.	Tenders	04
7.	Job interviews	05
	Total hours	32

5. **Suggested learning resources :**

1. Business Correspondence and report writing, by R C Sharma & Krishna Mohan, Tata Mcgraw hill, New Delhi 2002,
2. Principles and practices of Business Communication ,Doctor R. Doctor A., Seth Publishers,14th edition,2006
3. The functional aspects of communication skills, P. Prasad, Sharma K. Rajendra, S. K. Kataria and Sons,2006
4. Raul R. Timm, How to make winning presentations, Sneha printers, Mumbai,
5. Stand and Deliver, how to become a masterful communicator and public speaker,
6. Dale Carnegie Training, CPI Cox & Wyman, UK.

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Semester - V

Course code	Name of Course	TEACHING SCHEME in hours				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/OR	TW	
CE501	DOS-I (RCC)	4	-	4	8	75	25	25	25	150
CE502	Construction Management	4	-	-	4	75	25	-	-	100
CE503	Quantity Surveying & costing	-	-	6	6	-	-	50	50	100
CE504	Analysis of Structure	4	-	2	6	75	25	-	25	125
CE505	Soil Mechanics	3	-	2	5	75	25	-	25	125
E1	Elective-I	-	-	4	4	-	-	50	50	100
	Total	**15**	**-**	**18**	**33**	**400**		**300**		**700**

Semester - VI

Course code	Name of Course	TEACHING SCHEME in hours				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/OR	TW	
CE601	Irrigation Engg.	3*	-	-	3	75	25	-	-	100
CE602	DOS II (Steel)	3*	-	2*	5	75	25	25	25	150
CE603	Civil Engg. Project	-	-	4*	4	-	-	50	50	100
E2	Elective - II	3*	-	2*	5	75	25	25	25	150
IT501	Industrial Training			16	16	-	-	-	-	Grade
	Total	**9**	**-**	**24**	**33**	**300**		**200**		**500**

*Workload shall be doubled.

<u>Elective-I</u>
CE511 Structural Drawing
CE512 Advanced CAD
CE513 Comp Aided Civil Engg.
CE515 Advanced Construction Tech.
CE516 Interior Design
CS503 3D Printing

<u>Elective- II</u>
CE621 Transporation Engg. II
CE622 Construction Advanced
CE623 Geotechnical Engg.

CE624 Earthquake Engg.
CE625 Maintenance & Repairs of Civil Structures
CE626 Solid Waste Management
CE627 Airport Planning & Design
CE628 Planning & Constn. of Marine Structures
IE6** Institutional Elective

SEMESTER V

(CE501) DOS I (R.C.C.)

1. RATIONALE: Reinforced concrete is widely used in residential, public buildings and other civil engineering structures. To keep the pace confidently in construction industry, students 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 course content has been designed to enable the student 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

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE501 DOS I	L	T	P	C	TH	TM	TW	PR/OR	150
(R.C.C.)	4	-	4	8	75	25	25	25	

Minimum passing %: Theory 40%   *Duration of theory paper: 03 Hrs.*
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1	INTRODUCTION TO LIMIT STATE

Grades of concrete and steel. Loads and load combinations. Comparison of working stress method, ultimate load method and limit state method of RCC design. Definition and objectives-of different Limit states (collapse, flexure, compression and shear, serviceability, deflection etc). Characteristic values and design values for material and loads. Partial safety factors for materials and loads.

Unit 2	SINGLE / REINFORCED SECTIONS

Assumptions in Limit State of collapse in flexure, stress-strain relationship for concrete and steel. Neutral axis, stress-block diagrams and strain diagram. Derivation of expressions for depth of neutral axis and 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. Neutral axis, co-efficient, limiting value of moment of resistance and percentage of steel required for balanced section. Simple numerical problem on finding design constants moment of resistance, determining of dimension of section along with area of steel.

Unit 3   **SHEAR AND BOND**

Shear stress in R.C.C section, nominal shear stress, shear strength of concrete, maximum shear stress, truss analogy, minimum shear reinforcement, Design of shear reinforcement in beams using stirrups, bent-up bars and their combinations. Concept of bond and development length. Simple numerical problem on design of shear, reinforcement check for bond stress and development length.

Unit 4   **DOUBLY REINFORCED SECTIONS**

General features of doubly reinforced sections, necessity of providing doubly reinforced sections, reinforcement limitations, steel beam theory and its application. Simple numerical problems on determination of dimension of section along with area of steel.

Unit 5   **SLABS**

Design of cantilever slabs like chajjas, balcony slabs. Design of simply supported and continuous one-way slabs. Design-of two-way simply supported and continuous slabs. Design of dog- legged stair slab. Simple numerical problems on design of cantilever slabs, one-way slabs and two-way slabs only.

Unit 6   **COLUMNS AND FOOTINGS**

Analysis and design of axially loaded short rectangular and circular columns with lateral ties, check for minimum eccentricity. Design of square and rectangular footings with check for shear. Simple numerical problems on design of axially loaded columns and square and rectangular footings.

Unit 7   **OTHER RCC**
A) FLANGED BEAMS

General features and advantages of flanged beams. Effective width of flanges as per I. S. Code. General design procedure of T- beams and L - beams. No problems for exams.

B) RETAINING WALLS

General design procedure of cantilever type retaining walls earth level up-to top. Checks for stability and curtailment of stem reinforcement. No problems for exams.

C)WATER TANKS

Types of water tanks. General design procedure of underground water tanks. No problems for exams.

C) DETAILING

Bar bending schedule- Reinforcement layout, design drawings. Construction details at connections, column offsets, members with a break in direction, edge beams, intersection of members. Beam and column joints, rigid frame joints. Bar supports and cover to reinforcement. No problems for exams.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Introduction To Limit State	5	06
2	Single Reinforced Sections	9	15
3	Shear And Bond	9	12
4	Doubly Reinforced Sections	9	12
5	Slabs	12	12
6	Columns And Footings	10	12
7	Other RCC	10	06
		64	75

5. TERM WORK & PRACTICALS
Term work shall consisting of either 1 or 2:-

1. Sketch-book shall comprise of following items
    a. Simply supported R. C.C. slab,
    b. R.C.C. slab with an overhang,
    c. R.C.C. continuous one-way slab,
    d. Simply supported R.C.C. two-way slab,
    e. continuous R.C.C. two-way slab with different end conditions,
    f. R.C.C. Simply-supported singly reinforced rectangular beam,
    g. R.C.C. continuous singly reinforced rectangular beam,
    h. R.C.C. continuous T- beam,
    i. R.C.C. cantilever beam,
    j. R.C.C. dog-legged stair case,
    k. R.C.C. lintel cum chajja for a window opening,
    l. R.C.C. rectangular and circular column
    m. R.C.C. rectangular footing,
    n. R.C.C. retaining wall with horizontal earth surface,
    o. R.C.C. water tank
    p. Bar bending schedule for any one typical component.

2. Two imperial size sheets on design and detailing of Single storied R.C.C. building components along with report of calculations.-

6. LEARNING REFSOURCES

S. No	Author	Title of Books	Publication
1	S. R. Karve and V. L. Shah	Limit State theory and design of reinforced concrete structures	publishers and distributors, Pune
2	S. N. Sinha	Reinforced concrete design	Tata McGraw Hill Publishing Co.Ltd, New Delhi
3	Ashok K. Jain	Reinforcement concrete Limit State Design	, New' Chand and Bros Roorkee -
4	C. Syal and R. K. Ummat	Behaviour analysis and design of reinforced concrete structural elements	Wheeler publishing Co, Ltd, Allahabad
5	P. Purshothaman	Reinforced concrete structural elements	Tata McGraw Hill Publishing Co, Ltd, New
6	I. S. 456 - 2000	code of practice for plain and reinforced concrete	2000 edition Or Latest revision
7	I. S. 875 (part - I & part - II) - 1993	Code of practice for design loads	Or Latest revision
8		Hand book on Reinforcement and detailing special publication SP 34	Bureau of Indian Standard New Delhi, 1987
9	Unnikrishna Pillia	RCC Design	Tata McGraw Hill Publishing Co, Ltd, New
10	Dr. B. C. Punmia	Design of RCC Structure	Laxmi Publications , New Delhi
11	Sushilkumar	Treasure of RCC Design	Standard book House New Delhi

(CE502) CONSTRUCTION MANAGEMENT

1. RATIONALE: This core course of "Construction Management" provides a Civil Engineer with vital knowledge of the techniques of management and their application for the optimum utilisation of sources in the construction industries. In order that the resources are used efficiently, it is imperative that these management techniques are applied to the construction industry. The student is expected to acquire sufficient knowledge for planning, organising, scheduling and monitoring of the various activities relating to man power, finance, equipment, material and time, and hence the course content has been framed in that direction.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE502	L	T	P	C	TH	TM	TW	PR/OR	
CONSTRUCTION MANAGEMENT	4	-	-	4	75	25	-	-	100

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   **MANAGEMENT FUNDAMENTALS** Definition of management. Necessity and functions of management. Principle of management (Harry Foyal) and their application to civil engineering works. Leadership types. Requirement of an ideal leader. Motivation and its importance and function. Importance of communication and types of communication. Personnel, material, equipment management and their requirements. Important acts and labour laws related to construction activities.
Unit 2   **CONSTRUCTION ACTIVITY** Agencies associated with construction industries, their functions and their inter-relationship. 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. Site layout and its importance in execution.
Unit 3   **ORGANISATION STRUCTURE** Organisation of construction Industry. Necessity for an organisation. Principles of organisation. Types of organisation -Line organisation, line and staff organisation, functional organisation, their merits and demerits, simple organisation and chart for each. Organisational structure of P. W. D. Types of construction / contracting firms like sole proprietorship, partnership, private limited company and co-operative societies, corporations salient features of each. Definition, Importance, and necessity method of coordinating, controlling and decisions making in construction firms.

Unit 4	CONSTRUCTION PROJECT SCHEDULING

Scheduling and monitoring of construction projects. Methods of scheduling- Bar chart - CPM and PERT and their fields of application. Scheduling of bar chart and preparing construction schedule by bar chart for small projects, advantages and limitations of bar chart. Terms used and salient features of CPM, and plotting of critical path. (Simple problems with less than 15 activities).Brief idea about manpower and material scheduling, updating network and rescheduling of resources.

Unit 5	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. Sampling and checking techniques for testing of materials, tools, plant and equipment for ensuring quality. Introduction to ISO 9000 series-It's underlying features and drawbacks. Introduction to inventory control and stores management.

Unit 6	CONSTRUCTION SAFETY

Importance of safety in construction work. Cases 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. List of safety measures adopted at work site for- Excavation, scaffolding and form-work, fabrication and erection and demolition. Occupational hazards in construction industry.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Construction Management	8	12
2	Construction Activity	12	9
3	Construction Industry	12	12
4	Construction Project Scheduling	12	15
5	Construction Supervision And Quality Control	12	15
6	Construction Safety	8	12
		64	75

5. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	Robert L. Parity	Construction planning, equipment and method	Tata Mac- hill publication, New Delhi
2	IS 3764 - 1966	Safety code for excavation	
3	IS 3696 (part I & II) 1966	Safety code for ladders & scaffolding	
4	IS 1647-1960	Code of particle for fire safeties of buildings	
5	IS 4081-1986	Safety code for blasting and sealed drilling operations	
6	National building codes		
7	Haripal Singh	Construction Management & Accounts 1981	Tata Publication - NewDelhi
8	V.K. Raiva	Construction Management Practice	Tata Mac- hill publication, New Delhi
9	Galbert and B.M Dhir	Construction Planning and Management	Willey Easter Ltd Publication - Delhi
10	Anarjit Agarwal	Construction Management and P.W.D. Accounts	S.K. Kateria and Sons
11	Vazirani and Chavdale	Construction Management and Accounts	Khanna Publication- Delhi

(CE503) QUANTITY SURVEYING AND COSTING

1. **RATIONALE**: - This is core subject in Civil Engineering. The student must acquire knowledge and skills in measurements of quantities, investigating factors affecting cost of an item of work, and preparing detailed estimates. The student is expected to gain general knowledge and awareness of valuation, functions of P.W.D., and office records. The students must also understand the salient features and relevance of tenders and contracts adopted for civil engineering works so as to gain fair knowledge of these methods. The scope of the syllabus is restricted to general aspects of the prescribed text-books.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE503	L	T	P	C	TH	TM	TW	PR/OR	
QUANTITY SURVEYING AND COSTING			6	6			50	50	100

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS TO BE DELT ALONG WITH PRACTICALS

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unit 1. INTRODUCTION

Definition, of estimating and costing – purpose, data required for preparing an estimate – qualities of an ideal Quantity Surveyor.

Types of estimates – approximate or preliminary estimate, detailed, supplementary and revised estimate with brief description of each. Purpose of approximate estimate and methods of approximate estimation of a building and highway, administrative approval, expenditure sanction and technical sanction.

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unit 2. MODE OF MEASUREMENT

Standard unit of measurements - modes of measurements for different items of work for buildings and road work, provision for lump sum, spot item, and provisional sums. Degree of accuracy in estimating – General rules for measurement of work as per I. S. 1200. Significance of provision for contingencies, work charged establishment, centage. Provision for water supply, sanitation, and electrification. Case studies involving the above provisions for different Civil Engineering works.

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unit 3. DETAILED ESTIMATING AND ABSTRACTING

Types of forms used for detailed measurement and abstracting. Methods of taking out quantities – centre line methods and long wall and short wall method. Estimate and Abstract of different items for a single storied residential building from given plan

Road earth work – computation of earth work with no transverse slope using mean area and mean depth formula including soling area for pitching/turfing. Estimate of a road with WBM and bituminous road surface involving all basic items including computation of earth work, quantities of carious items with abstract.

Preparation of brief report on estimate both for building and road, including % cost for different stages of construction.

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unit4. RATE ANALYSIS

Factors considered for rate analysis – Schedule of rates and market rates for common materials and capacity – preparation of material estimate for common items of work. Rate analysis for common items of work (as specified in the term-work only).

Task Work – definition, factors affecting, task work for common items of building construction.

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unit 5. P. W. D PROCEDURES

Classification of works (Original, Repair, Minor petty Maintenance deposit)

Cash – Imprest and temporary advance, Importance of maintaining sites and office records, Types of records – Engineers diary, standard measurement book, muster- roll, work abstract, materials at site (M.A.S) account, daily labour, piece work.

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unit6. SPECIFICATIONS, Definition - purpose of specification – types and principles of writing specification. Case study with writing the detailed specification for 10 common items of civil engineering works. (as listed in TW)

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unit 7. TENDERS and CONTRACTS

Definition and purpose of tender: salient features of process f tendering. Definition of contract. 10 clauses of contract as listed in TW. Type of contracts: salient features, obligation of the parties to a contract. Earnest Money Deposit, Security Deposit, Running Account Bill and Final Bill. Opening of tenders, E –Tendering; Process, Digital Signature, Advantages

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4. TERM WORK & PRACTICALS

1) Modes of measurements and units in tabular form

2)Detailed estimate including plumbing with abstract for a single storied building having minimum Three rooms(One BHK) with RCC roof and calculation of percentage cost for foundation, Superstructure, Roofing, Woodwork, Flooring, Plumbing and Finishing.

3) Preparation of road estimates with abstract for a new bituminous road surface involving all items of work for a minimum length of one km including calculation of earth work and turfing/pitching.

4)Drafting of tender notice (Enclose Newspaper cuttings of tender notice).

5)Analysis of rates for any six of the common Civil Engg. Items / Specification:

 (a) Earth work excavation,

(b)Plain Cement Concrete,

(c)Laterite stone masonry in cement mortar,

(d)Brick work in cement mortar,

(e)RCC work including steel but excluding farm work,

(f)Wooden doors/windows (frames and shutters) including fixtures,

(g)Flooring with pre caste terrace/mosaic tiles,

(h)Internal and external plastering in cement mortar,

(i)Mangalore tile roofing over wooden battens,

(j)Conventional water proofing and chemical water proofing,

(k)Form work for columns, flats/sloping slabs and beams.

5. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	B.N. Datta	Estimation & Costing	S. Dutta & Co., Lucknow
2	M. Chakraborti	Estimation & Costing	
3	S.C. Rangawala	Elements Of Estimation and Costing	Charotar Publishing House, Anand
4	J.R. Mule	Valuation, Estimation and Costing	Charotar Publishing House, Anand
5	G.S. Birdi	Text Book of estimating	Dhanpatrai & Sons, Delhi
6	B. S. Patil	Civil Engineering Contracts and Costing	
7		C.P.W.D. Manual and Specifications and Rate Analysis	
8		Goa Schedule of Rates	
9		IS 7272, IS 1200	

(CE504) ANALYSIS OF STRUCTURES

1. RATIONALE: The course contents have been designed to assist in the determination of forces acting on a structure and to assess the effects of these forces and the behaviour of the structure in different conditions. Furthermore, the course contents also will develop the cognitive abilities and skills to facilitate the higher level study of design of structures.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE504	L	T	P	C	TH	TM	TW	PR/OR	
ANALYSIS OF STRUCTURES	4	-	2	6	75	25	25	-	125

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

L*-Lecture;* ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;* ***TH****- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   FLITCHED BEAMS
Definition of flitched beam, flitched beam theory, transformed section and modular ratio. Moment of resistance of composite section, permissible stresses, stress distribution across composite section. Analysis of beams of composite sections.(symmetrical and asymmetrical above the neutral axis)

Unit 2   COMBINED BENDING AND AXIAL LOADING
Typical cases of structure subjected to bending and axial loading. Eccentricity about one principal axis, Standard cases of stress distribution, extreme stress intensities, Limits of eccentricity for uniform stress distribution system, core of section, middle third rule, middle quarter rule, eccentricity about both principal axis.

Unit 3   COMPLEX STRESS SYSTEMS
One dimensional and Two dimensional stress system. Resolution of stress on oblique plane. Normal and tangential component of stress on oblique plane, magnitude and direction of resultant stress, maximum obliquity of the resultant stress, schematic representation. Magnitude and direction of oblique stress by graphical solution using Mohr's stress circle. Mohr's circle of stress for Principal stresses.Location of principal planes and planes of maximum shear. Principal stresses in beams and maximum shear stresses.

Unit 4   SLOPE AND DEFLECTION
Differential equation of elastic line for a beam subjected to bending. Derivation of formula for slopes and deflections for standard cases. Macaulay's method (Note: Cubic eqns. are not to be considered) Simple problems for cantilevers and simply supported beams with point loads and udl on full span.

Unit 5	FIXED BEAMS OF UNIFORM SECTIONS

Determination of fixed end moments for the beams carrying point loads and U.D.L. on full and part span.(Derivations not expected in exam). Construction of shear force diagrams and bending moment diagrams.

Unit 6	MOMENT DISTRIBUTION METHOD

Definition, Stiffness, relative stiffness distribution factor, carry over factor, Sign conventions. Analysis of continuous beams with uniform section (supports at the same level only) and carrying point-load and/or U.D.L over entire spans.(maximum four supports only). Analysis of single storeyed single horizontal span portal-frame carrying point load or U.D.L over entire span (only non-sway analysis). Construction of S.F.D. and B.M.D.

Unit 7	COLUMNS

Types of columns, definition- short and long columns. Effective length for different end-conditions. Slenderness ratio, Euler's formula for crippling-load for different end-conditions (derivation not expected). Limitations of Euler's formula. Rankine's formula(derivation not expected).

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Flitched Beams	6	8
2	Combined Bending And Axial Loading	8	10
3	Complex Stress Systems	8	10
4	Slope And Deflection	8	10
5	Fixed Beams Of Uniform Sections	8	10
6	Moment Distribution Method	14	15
7	Columns	12	12
		64	75

5. TERM WORK & PRACTICALS
Termwork shall include following:
    9. At least 4 problems on each unit above
    10. At least 2 drawing sheets plotting BMD and SFD for Units 5 & 6.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	S. Ramamrutham	'Theory of Structures	Dhapant Rai publication
2	S.B. Junarkar and Alvai	Mechanics of Structure - Vol I and II	Charotar Publishing House
3	O.P. Jain and B.K. Jain	Theoryandanalysisof Structures	New chand and Bros 1957
4	B.C. Punmia	Analysis of Structures	Laxmi Publications,New Delhi
5	B.B. Lord	Strength of Materials	Newage International New Delhi
6	Singer	Strength of Materials	Harpercollins College Div
7	P. V. Warnock	Strength of Materials	London –Pitman-1943

(CE505) SOIL MECHANICS

1. RATIONALE: A sound understanding of the fundamental principles of soil mechanics is needed to predict the behaviour and performance of soil as a construction material and / or as a supporting medium of engineering structures. The course content has been designed to acquaint the students with the behaviour of different types of soils and their properties to enable him 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

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
CE505 SOIL MECHANICS	3	-	2	5	75	25	25	-	125

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

L-*Lecture;* **T** - *Tutorial;* **P** - *Practical;* **C**- *Credit;*   **TH**- *End Semester Theory;* **TM** – *Test Marks:*

PR/OR - *End Semester Practical / Oral Examinations;* **TW**- *Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   INTRODUCTION & PROPERTIES
Importance of soil studies in Civil Engineering Geological origin of soils with special
reference to soil profiles in India :Residual and transported soil, Aluvial deposits. Lake
deposits, dunes and loess, glacial
deposits, conditions in which above depositsare formedandtheir engineering characteristics.
Engineering classification of soils, comparison between sand and clay. Physical Properties of
Soils:
Constituents for soil, phase diagram for soil
Definitions and meaning of void ratio, porosity, degree of saturation, water
content, specific gravity of soil grains, unit weight, dry unit weight
Simple numerical problems with the help of phase diagrams

Unit 2   . SOILS CLASSIFICATION AND IDENTIFICATION
Particle size, shape and their effect on engineering properties of soil
Gradation of soil particles and its influence on engineering properties
Relative density and its use in describing cohesion less soils
Behaviour of cohesive soils with change in water content, Aterberg limitsdefinitions, use
and practical significance
Field identification test for soils
BIS soils classification systems; basis, symbols, major divisions and sub divisions,
groups, plasticity chart: procedure to be followed in classifying a given soil into a group

Unit 3 FLOW OF WATER THROUGH SOILS:/PERMEABILITY

Concept of permeability and its importance

Darcy's law, coefficient of permeability, seepage velocity and factors affecting

Permeability Comparison of permeability of different soils as per BIS

Measurement of permeability in the laboratory and in the field

Unit 4 . STRENGTH CHARACTERISTICS OF SOILS

Examples of shear failure in soils

Factors contributing to shear strength of soils, Coloumb's law

Determination of shearing strength dirct shear testand unconfined compression test. Brief ide a about triaxial shear test, comparison between direct shear test and triaxial test.

Drainage conditions of test and their significance

Stress and strain curve, peak strength and ultimate strength, their significance

Discrepancies between laboratory and field tests

Unit 5 EFFECTIVE STRESS & DEFORMATION OF SOILS: (Concept Only)

Stresses in subsoil

Definition and meaning of total stress, effective stress and neutral stress

Principle of effective stress

Importance of effective stress in engineering problems

Deformation of Soils

Meaning, conditions/situations of occur rence with emphasis on practical significance of:

a) Consolidation settlement

b) Creep

c) Plastic flow

d) Heaving

e) Lateral movement

Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation

Meaning of total settlement, uniform settlement, different settlement and rate of settlement and their importance

Settlement due to construction operations and lowering of water table

Tolerable settlement for different structures as per BIS

Unit 6 BEARING CAPACITY

Concept of bearing capacity

Definition and significance of ultimate bearing capacity safe bearing capacity and alowable bearing pressure

Bearing capacity from building codes

Factors affecting bearing capacity

Concept of vertical stress distribution in soils due to foundation loads

Plate load test and interpretation of its results, limitations of plate load test

Bearing capacity by SPT and unconfined compression test

Soil properties governing choice of foundation type

Methods of improving bearing capacity of soil

Unit 7   SOIL COMPACTION

Definition of compaction and its necessity

Laboratory compaction test (light and heavy as per BIS) definition and importance of optimum water content, maximum dry density, moisture dry density relations for typical soils wit h different comp active efforts

Field compaction: methods and equipment, choice of equipment

Compaction requirements

Compaction control; Density control, field density test. (sand replacement), moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction

Factors affecting compaction

Unit 8   SOIL EXPLORATION

Purpose and scope of soil exploration. Undertaking planning of subsurface investigations. Influence of soil conditions on exploratory programme.Possibility of misjudgement of subsoil conditions

Location, depth and spacing of exploration. Influence of size

of project and type of structure on exploratory programme. Methods

of soil exploration; Reconnaissance, Trial pits, borings, (Auger, wash, rotary percussion to be briefly dealt), SPT and dynamic cone penetration test (Brief description and information collected), Dilatometer Test.

Sampling: undisturbed, disturbd and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance. Number and quantity of samples, resetting, sealing and preservation of samples. Presentation of soil investigation results(Bore hole logging)

Unit 9   GROUND IMPROVEMENT TECHNIQUE

 Soil Stabilization, Soil Grouting, Soil Reinforcement with Geotextiles, Soil Nailing,

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	INTRODUCTION & PROPERTIES	06	09
2	SOILS CLASSIFICATION AND IDENTIFICATION	06	09
3	FLOW OF WATER THROUGH SOILS:/PERMEABILITY	06	09
4	STRENGTH CHARACTERISTICS OF SOILS	08	12
5	EFFECTIVE STRESS & DEFORMATION OF SOILS	04	06
6	BEARING CAPACITY	03	06
7	SOIL COMPACTION	06	09
8	SOIL EXPLORATION	06	09
9	GROUND IMPROVEMENT TECHNIQUE	03	06
		48	75

5. TERM WORK & PRACTICALS
Practicals shall include Journal containing the following tests (Minimum ten)
1. Determination of specific gravity of soil by Pycnometer.
2. Determination of field-density of soil by Core cutter method.
3. Determination of field-density of soil by sand replacement method.
4. Determination of Liquid Limit.
5. Determination of Plastic Limit.
6. Determination of Shrinkage Limit.
7. Grain size distribution by Sieve analysis.
8. Standard Proctor Compaction (Light) test.
9. Direct Shear Test
10. Unconfined Compression test.
11. Triaxial-test- (Study experiment).
12. O.C.B.R. test.
13. Vane shear test (Demonstration).
14. Consolidation test.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	C. Venkataramaiah	Geo-Technical Engineering	New age International Publishers
2	Alam Singh	Soil Engineeling-Theory & Practicals	IBT Publication New Delhi
3	Gopal Ranjan & A.R. Rao	Basic and Applied Soil Mechanics	New age International Publishers
4	B.C. Purnima	Soil Mechanics & Foundation Engineering	Laxmi publication Pvt.Ltd 22Golden house New Delhi
5	Bharat Singh	Soil Mechanics & Foundation Engineering	Laxmi publication Pvt.Ltd 22Golden house New Delhi
6	Purushotam Raj	Soil Mechanics & Foundation Engineering	Tata MeGrawHill New Delhi.
7	Braja M Das	*Principles of Foundation Engineering*	Global Engineering, USA

(CE511) STRUCTURAL DRAWINGS

1. RATIONALE: A passout should be able to draw (plan, C/S, L/S, details etc. from given data-size, shape, reinforcement, cover, sections etc) and interpret structural drawings fluently, also to prepare material schedule and bar bending schedule from structural drawings. He should know all symbols used in RCC and Steel fabrication works.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
CE511 STRUCTURAL DRAWINGS	-	-	4	4			50	50	100

Minimum passing %: Theory 40%
Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

PR/OR - *End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   BASICS
Necessity of structural detailing, welding symbols, riveting symbols, representation of materials, common abbreviations and symbols used in RCC plans, bar bending schedule, brief revision of taking out quantities and material schedule.
Unit 2   BASIC R.C.C STRUCTURES
Beams (rectangular and tee beams) (straight and curved) (simply supported, continuous and cantilever), edge beams , intersection of members
Columns-rectangular and circular ,beam-column junctions, column offsets
Slabs-one way and two way, openings in slabs , joint at ridge of sloping roof
Footings-simple rectangular and circular, combined, strap
Staircase-dog legged, open well, cantilever and riser-thread(without waist slab)
Unit 3   BASIC STEEL STRUCTURES
Columns-compound and braced , design at connections, beam sections
Simple roof structures
Column bases-(slab, gusseted and grillage)

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Basics	8	15
2	Basic R.C.C Structures	12	20
3	Basic Steel Structures	12	15
		32	50

5. TERM WORK & PRACTICALS

Practicals shall include following:

1. To prepare 4 RCC drawing sheets from given data (size, shape, reinforcement, cover, sections) for all items each from units 2 and 3
2. Prepare bar bending schedule from RCC structural drawings above
3. To prepare 3steel drawing sheets from given data Prepare material schedule from steel structural drawings above. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publications
1	V.B. Sika	A course in civil engineering drawing	
2		Hand book of concrete reinforcement and detailing -IS1	
3	Malik and meo	A text book of draftmen civil	
4		SP 34	

(CE513) COMPUTER AIDED CIVIL ENGINEERING

1. RATIONALE: A pass-out working in a design office should be able to plot and design civil engineering structures using a computer. He has to have the capacity to use the latest software and available software to perform office duties related to civil engineering.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE513	L	T	P	C	TH	TM	TW	PR/OR	
COMPUTER AIDED CIVIL ENGINEERING	-	-	4	4	-	-	50	50	100

Minimum passing %: Theory 40%
Legends:

***L**-Lecture;* ***T**- Tutorial;* ***P** - Practical;* ***C**- Credit;* ***TH**- End Semester Theory;* ***TM** – Test Marks:*

***PR/OR** - End Semester Practical / Oral Examinations;* ***TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 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
Unit 2 STRUCTURAL DESIGN
• Various software available such as STAAD-Pro, STRUDS, SuperCivil   • analysis of portal frame, truss, space frame, girders ,   • introduction to FEM   • design of beam, Column, footings, retaining walls, slabs
Unit 3 DRAFTING AND PLOTTING
• Various software available like AutoCAD,   • Computer Aided Drafting of plan, 2-elevations, section and site plan of a House with pitched-roof and flat roof   • Computer Aided Drafting of plan, 2-elevations, section and site plan of a factory shed   • Computer Aided Drafting of garden/landscaping   • Computer Aided Drafting of subdivision of plots   • 3D structures like buildings, dams, bridges,

Unit 4	PLANNING

- Various software available like MS-Project
- Networking using CPM/PER T
- Scheduling and costing
- Break even analysis
- Inventory control

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Introduction	4	10
2	Structural Design	10	15
3	Drafting And Plotting	10	15
4	Planning	8	10
		32	50

5. TERM WORK & PRACTICALS
Term work shall preferably consist of the following:

1. Written assignments on application, need, advantages, disadvantages and trends in use of computers in civil engineering.
2. Written assignments on utility and availability of software in civil engineering planning design and execution.
3. Written assignments on utility of information-technology and internet for effective functioning of a civil engineers office.
4. A complete submission file including application for permission letters, certificates, forms, relevant plans and drawings, structural designs and drawings, site plans, measurement and abstract sheet and bar-chart schedules for a 100m2 G+2 (framed R.C.C. structure) residential bungalow- to be done using software available with institute.
5. A complete Client-Owner file including application for tender documents, typical contract, annexure, work-order, completion certificate, relevant plans and drawings, structural designs and drawings, site plans, measurement and abstract sheet and bar-chart schedules for a steel framed structure / factory shed- to be done using software available with institute.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1		Internet Resources	
2		AutoCad Manual	
3		STAAD/STRUDS manual	
4		Ms Project & office manual	

CS503 – 3D PRINTING															
Teaching Schedule Per Week			TW		PR/OR								Total		
Lectures	Practical	Credits													
-	4	4	50		50								100		
Pre-requisite		Source	USERS	1	2	3	4	5	6	7	10	11	12	13	14
Nil				15	16	20	21	23	24	28	29	34	35	36	

Rationale: 3D Printing is a new technology when compared to traditional manufacturing processes and the purpose of this course is to give students a head start. The course is designed to be an introduction to the technology while at the same time explaining the concepts involved in designing parts and assemblies for manufacture by 3D printing. Traditional design concepts fall short when it comes to 3D printing and knowledge of these concepts will add significant value to students as they get ready to face the challenges of the real world.

COURSE CONTENTS	Hrs	Mks
1. INTRODUCTION TO 3D PRINTING	2	3

Introduction to 3D Printing – what is it, how it works. History of 3D Printing – who invented it and when. Processes – different 3D Printing processes available today. Application – use of 3D Printing, today and tomorrow. Course summary – what will be taught during this course?

	Hrs	Mks
2. FUNDAMENTALS, PROCESSES & MATERIALS	3	7

Basic requirements – list of basic requirements for successful 3D Printing. Processes – 3D Printing Processes in brief – FDM, EBM, SLS, SLA, etc. Materials – list of materials used and available – PLA, ABS, Metal Alloys, Ceramic powders, etc. Possibilities and Limitations. FDM – detailed knowledge of FDM process.

	Hrs	Mks
3. INTRODUCTION TO FDM 3D PRINTER	2	4

FDM 3D Printer – process, specifications, how to use. 3D Printer in action – print bundled models to get the first experience of the FDM 3D Printer in action. Do's and don'ts – things to be kept in mind while designing for/printing on FDM 3D Printer. Rafts & Supports – their use and how to avoid them.

	Hrs	Mks
4. EFFICIENT 3D PRINTING	2	3

Brief introduction to 1.Orientation – meaning and purpose, 2.Clearance – meaning and use, 3.Wall thickness – meaning, purpose & importance, 4.Accuracy/inaccuracy – understand and take advantage of it, 5.Movable Parts – meaning and how to achieve them, 6.Assemblies – definition and how to build them.

	Hrs	Mks
5. ORIENTATION	3	4

Definition. Orientation and Successful Printing. Avoid rafts & supports using appropriate orientation. Orientation for defect free printing. Experiments with Orientation.

	Hrs	Mks
6. CLEARANCE	5	5

Definition. Effects of lack of clearance with different processes and different materials. Clearance for FDM 3D Printer and its materials. Clearance while modelling. Knowledge of Clearance and its benefits. Experiments with Clearance.

	Hrs	Mks
7. WALL THICKNESS	5	8

Definition. Its importance in 3D Printing. How does it differ from process to process and material to material? Effects of having 'thinner' walls than the required minimum wall thickness. Experiments with wall thickness.

8. ACCURACY/INACCURACY	7	11

Definition – accuracy in terms of different processes and materials. Accuracy of objects printed on FDM 3D Printer. Adjustments necessary in the Model to compensate the inaccuracies. Experiments with Accuracy/Inaccuracy.

9. MOVABLE PARTS	10	16

Definition – what are Movable Parts and how to design them? How to achieve this on a FDM 3D Printer with the help of 'orientation', 'clearance', 'wall thickness', 'accuracy', etc. discussed earlier. Precautions – things to keep in mind while designing movable parts. Experiments with Movable Parts.

10. ASSEMBLIES	12	16

Definition. How to create them. Exercise – design fully functional assemblies. Experiments with Assemblies.

11. PRINTABILITY	8	13

Definition – overall printability of a given model and how it's determined. Do's and don'ts. Design error free models. How to diagnose and fix errors. Experiments with Printability.

12. 3D PRINTING TODAY	3	5

3D Printing and its growth till date. Current application of 3D Printing in Prototyping, Jewelry, Industrial Design, Architecture, Engineering and construction, Automotive, Aerospace, Dental and Medical Industries, Education, etc. Impact of 3D Printing. Factors that affect 3D Printing today e.g. Lack of knowledge, cost, availability, etc.

13. FUTURE OF 3D PRINTING	2	5

How fast is it growing. Predictions from the experts about its future. Possibilities – new processes, materials, new applications, etc.

Total	64	100

PRACTICALS
1. Print for the first time using bundled creations.
2. Model and print objects to demonstrate negative and positive effects of Orientation.
3. Model and print objects with accurate clearance.
4. Experiment with minimum wall thickness by modelling and printing objects with different wall thickness.
5. Experiment with accuracy of the prints and model objects that will be physically accurate after printing.
6. Design Movable parts and print them in one piece.
7. Create assemblies - either printed as one piece or assembled later or combination of both.

REFERENCE

ANALYTICAL TABLE OF CONTENTS

SEMESTER VI

(CE601) IRRIGATION ENGINEERING

1. RATIONALE: This course is considered as most important for Diploma in Civil Engineering programme because, a Civil Engineer 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. Majority of the rural population of our country is dependent on agriculture for their livelihood and therefore, this course of Irrigation Engineering forms a core subject for civil engineers. The scope of the syllabus is restricted to the prescribed text-books only.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE601 IRRIGATION ENGINEERING	L	T	P	C	TH	TM	TW	PR/OR	100
	3	-	-	3	75	25	--	--	

Minimum passing %: Theory 40%　　　　　　　　　　*Duration of theory paper: 3 Hrs.*
Legends:

L*-Lecture;* ***T*** *- Tutorial;* ***P*** *- Practical;* ***C****- Credit;* ***TH****- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW****- Term Work*

3. DETAILED COURSE CONTENTS

Unit 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 multi-purpose projects. Investigation for an irrigation project- Preliminary and detailed engineering surveys. Geological and hydrological surveys.

Unit 2　　　　　HYDROLOGY
Definition of hydrology and hydrologic cycle. Rainfall-factors affecting rainfall, measurement of rainfall by symons rain gauge, weighing bucket type automatic rain gauge. methods of calculation of average annual rainfall over a basin: Arithmetic average method, Theissons polygon method and Isohyetel method. Catchment area- Definition. Definition of Run-off and factors affecting run-off, Computation of run-off: run-off co-efficients, Ingli's formula for ghat and non-ghat areas.

Unit 3   WATER REQUIREMENTS

Crop seasons such as kharif, rabi, and perennial and their period types of crops grown in each season with their crop period. Definitions of terms - Duty, Delta, Crop period, Base-period, time factor, capacity factor, intensity of irrigation, Gross Commanded Area, Culturalble Commanded Area, un-culturable commanded area. Relation between duty and delta with derivation. Factors affecting duty, methods of improving duty. Rotation of crop, purpose. 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.

Unit 4   GRAVITY DAMS

Definition of a dam, classification and types of dams, Preliminary surveys, Final surveys and data to be collected before site selection for a dam, factors to be considered for site selection of a dam. Definition of a gravity dam, forces acting on a gravity dam, resisting force and acting forces on a gravity dam, expressions for self weight, water pressure and uplift pressure in gravity dams, Types of failures of gravity dams: sliding, overturning and tesile or crushing failures, derivation of expression for no sliding condition, no tension condition and no overturning condition, theoretical profile and practical profile.

Openings in gravity dams: drainage gallery and other galleries, their functions. Joints in gravity dams.

Unit 5   EARTH DAMS

 Types of Earth dams: Hydraulic filled dams and rolled filled dams. Brief method of construction, Homogeneous, core type and diaphragm type, suitability and limitations of earth dams. Types of failure of earth dams: Hydraulic failure, seepage failure and structural failure. Seepage through earth dams, pheratic line, drainage in earth dams such as rock toe. Remedial measures for strengthening dams.

Unit 6   STORAGE RESERVOIR

Functions of storage reservoir, factors to be considered for the selection of site for a reservoir. Definition of terms- 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, problems on fixing various levels of a reservoir. Sedimentation in reservoirs. Preventive measures to control sedimentation. Losses in reservoir-Evaporation and absorption losses, factors affecting these losses and measures to control reservoir losses.

Unit 7   SPILLWAYS:

Definition, types and their location, straight drop spillway, ogee type, duck bill type. Types of gates, Energy dissipaters: definition, types.

Unit 8   MINOR IRRIGATION SCHEMES

Bandhara-Layout and component parts. Advantages and disadvantages.

Unit 9	CANALS
Classification of canals, factors to be considered during alignment, method of alignment of canals: ridge and contour alignment. Typical cross-sections of canal in cutting, embankment, partial-cutting and partial embankment. Canal lining, necessity, types of lining, advantages and disadvantages of canal lining, maintenance of canals.	

Unit 10	CROSS DRAINAGE WORKS
Definition of C.D works, types: Canal crossing over a drain, Drain crossing over a canal, Canal and a stream crossing at same level.	

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Introduction	2	3
2	Hydrology	8	9
3	Water Requirements	9	9
4	Gravity dams	8	12
5	Earth dams	5	9
6	Storage Reservoir	6	9
7	Spillways	3	4
8	Minor Irrigation Schemes	2	6
9	Canals	3	8
10	Cross Drainage Works	2	6
		48	75

5. TERM WORK & PRACTICALS

termwork shall include following:
1. At least 3 Study assignments of each of the units.
2. Study of models of various storage and irrigation works and projects.
3. Study visit or tour to a irrigation project site.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	V.P Periyan	The foundation principle of Irrigation Engg.	
2	Varshney S.C Gupta	Theory and Design ofIrrigation Engineering and hydraulic structures	Oxford IBH Pub. Co. Delhi
3	Bharat singh	Fundamentals of Irrigation Engg	Nanchand and Bros, Rorkee
4	B.C. Pumnia, Pande, & B.B.Lal	Irrigation and Water Power Engineers	9th-Standard probe distributors Delhi-6
5	K.R Sharrn	Irrigation Engg vol I, II & III	
6	Birdi & Das	Irrigation Engineering	
7	IG Dahigaonkar	Textbook ofIrrigation Engineering	
8	S.K Garg	Irrigation and Hydraulic Structure	Khanna publication, Delhi-6

(CE602) DOS II (STEEL)

1. RATIONALE: This course content is designed to teach the student elementary knowledge in design of common elements he will come across in real life in the construction industry. Student should acquaint himself with latest codes and methods of design.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE602 DOS-II (STEEL)	L	T	P	C	TH	TM	TW	PR/OR	150
	3	-	2	5	75	25	25	25	

Minimum passing %: Theory 40%　　　　　　*Duration of theory paper: 3 Hrs.*

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;　TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations;　TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1　　　　INTRODUCTION TO STEEL STRUCTURES Applications of structural steel. Sections used in structural steel. Types of loads on structural steel. Advantages and disadvantages of steel structures. Types of end connections. Comparison of welded and riveted joints. Types of welds and welding symbols. Strength of welded joint
Unit 2　　　STEEL TENSION MEMBERS Provisions for tension members as per latest IS Code. Design of concentrically welded joint for tension members. Design of eccentrically loaded fillet-welded joint for tension members with load in plane of weld. Design of tie of single and built up section with welded connections..
Unit 3　　　STEEL COMPRESSION MEMBERS Provisions for compression members as per latest IS Code. Design of column of single and built up section (no lacing and battens design) with welded connections. Design of slab base footing for column with PCC pedestal and with welded connections.
Unit 4　　　STEEL BENDING MEMBERS Factors governing the design of beams as per latest IS Code. Design of beam of single section. Check for shear, web buckling, web crippling only.
Unit 5　　　STEEL TRUSS Loads coming on the roof. Determination of forces in roof truss by graphical method. Design of members of steel truss with welded connections. Design of purlins

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Introduction To Steel Structures	5	13
2	Steel Tension Members	6	13
3	Steel Compression Members	8	18
4	Steel Bending Members	7	18
5	Steel Truss	6	13
		32	75

5. TERM WORK & PRACTICALS

Term work and Practicals shall include following:
1. Sketch book with structural sketches in all topics.
    2. Two Imperial size drawing sheets with relevant structural drawings.
    3. Problems on each topic.

6. SKETCH BOOK SHALL INCLUDE THE FOLLOWING:

1. Structural Steel Sections, Angles, Tees, Channels & I Section
2. Tension Members
3. Compression Members,
4. Slab Base
5. Gusseted Base
6. I – Section and Built up Beams
7. Framed connections
8. Roof trusses: Line Diagram and details of Joints.

7. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	I S Code	Is Codes 800/875 - 2000	ISI
2	L. S. Negi	Design Of Steel Structures	Tata McGraw hill
3	Ramchandran	Design Of Steel Structures	Std Book House
4	S K Duggal	Design Of Steel Structures	Tata McGraw hill
5			
6			

(CE603) CIVIL ENGINEERING PROJECT

1. RATIONALE: 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 10 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.

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2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE603	L	T	P	C	TH	TM	TW	PR/OR	
CIVIL ENGINEERING PROJECT I	-	-	4	4	-	-	50	50	100

Minimum passing %: Theory 40%
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

The project shall consist of the following activities:

1. Identifying the aims, objectives and different works to be carried out in the project.
2. Prepare a preliminary plan of the project from data-collection to execution stage.
3. Collecting data relevant to project from all possible sources including conducting interviews, data-surveys, measurements, site-surveys, references, books and internet.
4. Conducting case studies (at least one if possible) and surveys of similar projects in the immediate neighbourhood (if possible).
5. Rough assimilation of data to suit the projects aims and objectives.
6. Selection of most efficient alternative / method from the available data based on preliminary investigation.
7. Collection of additional and supplementary data if necessary.
8. Presenting the data collected in an organized manner in print format.
9. Data collected will be required to integrate and prepare a comprehensive project report.

The topics may include following:

The project could be on any topic covered during the course of the studies. Design of a small Residential/commercial building project is not a suitable project. The following is an indicative but not exhaustive list.

1. Study of traditional structures and local building techniques
2. Design of water-supply and distribution system for a township,
3. Design of a sewerage-system for a township,
4. Resurvey of existing town/village area using latest techniques/equipments
5. Design of economical concrete mix with alternate/construction-waste/local materials
6. Design of low cost housing schemes for rural areas,
7. Design of low cost housing schemes for slums in urban areas,
8. Design of solid waste disposal plant for rural or urban areas
9. Design of rural water supply schemes,
10. Design of rural sanitation schemes,
11. Design of rural waste disposal schemes,
12. Design of rural/hill road and transport schemes,
13. Design of gobar gas plants,
14. Sub-division layout of a site
15. Design of Water supply sanitation and drainage scheme for a 100 unit neighbourhood complex
16. Road layout of a residential/industrial complex,
17. Design of roads using industrial/construction and mining wastes
18. Design of shuttering and scaffolding for structural elements,
19. Design of traffic junctions in the city,
20. Carry out and classify Soil/geotechnical study of project area and sub strata
21. Development of traditional springs,
22. Design of Temporary structures for fairs and exhibitions,
23. Traffic design for festivals and Zatras
24. Design of Full Beach Development
25. Design of theme parks
26. Design of institutional buildings
27. Design of public buildings
28. Design of green building / intelligent buildings
29. Design of airport
30. Design of ropeways and cableways
31. Design of helipads for tourism related activities
32. Design of outflow treatment plant for existing factories
33. Design of docks and harbours
34. Design of tunnels
35. Design of storm water drains
36. Design of railway station and yards
37. Design of warehouse complex
38. Design of cold storage complex for farm products
39. Design of silos
40. Design of children's park,
41. Design of parking lots
42. Design of stadia and community play/sports grounds
43. Design of pile foundations
44. Design of marine retaining walls / structures

45. Design of shore protection works
46. Design of slope protection works and soil retaining structures
47. Design of rural energy devices-solar/water/wind...
48. Design of machines to specifically aid civil engineering works.
49. Design of reinforced mud structures
50. Design of fibro-cement and ferro-cement structures
51. Design of Community Type Chulha cookers and stoves for rural populations
52. Design of shell roofing
53. Design of ropeways and bridges
54. Design of rainwater harvesting schemes
55. Design of waste-water recycling scheme
56. Design of drip irrigation scheme
57. Design of rehabilitation of polluted stream/lake/river
58. Design of mine-waste utilisation schemes.
59. Design of curved and shell roofs
60. Design of underwater aquarium/ theme park
A futuristic design using computer based simulation can also be undertaken provided it has enough work-load for the student.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Guidance Hours	Marks
1		4 hours/per week/batch	50

5 . TERM WORK & PRACTICALS

The project report must include the following: Introduction, Synopsis (500 words), acknowledgements, bibliography and reference, summary and conclusion, along with all figures/drawings/photographs/ tables as necessary. It shall include the data collected

6. LEARNING REFSOURCES

As per the topic of the project Presenting the data collected in an organized manner in print format.

(IT501) INDUSTRIAL TRAINING

1. RATIONALE:

Industrial Training is a newly introduced component, in the curriculum under Revised Semester Pattern system for all 03 year Diploma Programmes. It is a Training programme designed to expose & prepare the students for the Industrial work situation. This exposure and hands on experience, will further enhance the prospects of student fraternity to be better placed on completion of their course.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory		Practical		
	L	T	P	C	TH	TM	PR/OR	TW	
IT501 INDUSTRIAL TRAINING	-	-	16	16	-	-	30	70	GRADE

Minimum passing %: 40%

Legends:
PR/OR - *End Semester Practical / Oral Examinations;* **TW-** *Term Work*

3. DETAILED COURSE CONTENTS

Students are required to study and have hands-on experience wherever possible in the following areas (depending on availability):

1. Company Profile
2. Organizational Structure
3. Company Product Range
4. Manufacturing Facilities Available /Services provided
5. Plant / Facility Layout
6. Operations / Production Processes
7. Production Planning and Control
8. Detail study of Latest Equipment/ Technologies Used
9. Stores Functions
10. Material Handling Systems/ Equipments
11. Quality Management Systems / Functions
12. Maintenance and Repair Practices
13. Safety Practices / Safety Equipments
14. Utilities
15. Logistics
16. Sales and Marketing
17. Ethics, Statutory Rules and Regulations followed
18. Product Design and Development
19. Any other area specific to the Industry providing Training

4. TERM WORK & PRACTICALS

Evaluation Scheme					
TW				PR/OR	
Attendance Marks*	Industrial Mentor's assessment Marks	Institute Mentor's assessment Marks	Training Report	Report Assessment & Seminar/Viva	TOTAL Marks
10	20	20	20	30	100

* 01 mark shall be deducted for every Absence (with or without permission).

Daily Dairy

The daily dairy should-be maintained in a book. It should reflect the day to day activities performed by the student (including task, men and materials involved). It should be counter signed by the Industry Mentor. It will become the basis for writing reports on the complete training.

Training Report

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 high lightened, including 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.

Note :

a. Student/s undergoing Industrial Training shall follow Rules and Regulations of the Industry.

b. Industrial Training will generally be organised and conducted in accordance with Industrial Training Manual duly prescribed by the Board.

5. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No	Name of the Unit	Teaching Hours	Marks
1	PR/OR	08 Weeks	30
2	TW		70
	Total	**08 Weeks**	**100**

Note:

1. For Industrial training Grades will be awarded based on marks scored as follows:

80% and above Marks – Grade 'A'

60% to 79% Marks – Grade 'B'

40% to 59% Marks – Grade 'C'

Marks below 40% - Grade 'D'

2. TW and PR/OR shall be separate heads of passing. Student has to secure minimum 'C' Grade for passing.

(CE621) TRANSPORTATION ENGINEERING II

1. RATIONALE: Transportation Engineering is an essential and important area of activity for the socio-economic development of any region. The Civil Engineer is actively involved in the planning and execution of transportation net works such as roads, railways, airports and related structures viz. bridges, tunnels, docks and harbours. This course content on Advanced Transportation Engineering has been designed to provide the students with sufficient understanding of different operations involved in areas of transportation other than roadways.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE621	L	T	P	C	TH	TM	TW	PR/OR	
TRANSPORTATION ENGINEERING II	3		2	5	75	25	25	25	150

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

Unit 1   RAILWAYS

Introduction- Advantages and disadvantages of rail travel, 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 and double line.

Permanent-way Definition and Component parts with cross-section.

Rails- Functions, types, standard section. Types and Functions of Rail joints. Creep of rails and remedial measures.

Sleepers-Functions, types, merits and demerits, fixtures used, sleeper density.

Ballast-Function, requirements, materials used as ballast, their suitability, renewal of ballast.

Alignment- Alignment of a railway track, factors controlling the alignment. Methods of laying the track.

Points and crossings-Necessity, types and brief description.

Yards-Types, function and layout.

Bullet-trains -Special consideration for bullet trains.

Unit 2   TUNNELS

Introduction- Definition, purpose, advantages and disadvantages, Typical cross-sections, Clearance diagram for rail and road tunnels.

Tunnel construction - Alignment of tunnel- factors affecting the alignment. Setting out for the tunnel and locating the centre line inside the tunnel. Method of tunnelling operation in hard rock and in soft ground, safety precautions in tunnelling.

Lining of tunnels- definition, objectives and types of lining.

Ventilation- definition, objectives and types,

Dust control- definition, objectives and preventive measures.

Drainage of tunnels- definition, objectives and methods of drainage.

Unit 3   HARBOURS, DOCKS AND RELATED STRUCTURES

Harbour and ports- Advantages and disadvantages of sea travel, Definition, function, components, Layout, types (natural and artificial), Selection of site and classification.

Docks -Definition, function, classification (dry dock/wet dock) and their comparison, method of construction.

Locks and lock gates- Definition, function, types and method of operation,

Break-water- Definition, function, types, method of construction,
Jetties and quays- Definition, function, types and method of construction.
Warehouses and transit sheds, Definition, function, location and method of construction.

Unit 4   AIRPORTS

Introduction –Advantages and disadvantages of air travel, classification, location, size and site selection.

Runway and Taxiways - Definition, functions, configuration/layout (single, parallel and divergent). Basic runway length and width, longitudinal and transverse gradient, location

Terminal areas – Function and location of various units in a terminal building, apron, control tower and hangers.
Airport drainage. Definition, function and location
Airport lighting. Definition, function and location

Unit 5   ALTERNATIVE MODES OF TRANSPORTATION

Introduction to cable-craft, hovercraft, hydrofoils, sky-bus, monorail, etc.

Future trends in transportation (space tourism, driverless cars, etc).

Automation in transportation

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Railways	16	20
2	Tunnels	8	10
3	Docks And Harbours	10	10
4	Airports	10	10
5	Alternative Modes	4	5
		48	75

5. TERM WORK & PRACTICALS

Term work shall include following:
1. 10 Study assignments on above topics
    2. Industrial visits should be arranged for:-Railway Station, Tunnel, Harbors, Airport to support the theoretical knowledge gained in theory classes. The students should be asked to submit detailed report of the visit with sketches and photographs for progressive assessment.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	B.L. Gupta & Amit Gupta	Roads, Railways, Bridges Tunnel Engg	standared publications, 1705- B, Naisarak Delhi- 6
2	N. Vaziram & S.P Chandola	Transportation Engg. Vol I & II	Khisnna Publishers, 2-B, Nath market, Nai sarak Delhi
3	Birdi & Asuja	Roads, Railways, & Bridges	standard book house, New-Delhi
4	Saxena &Arora	A Textbook of Railway 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	S.P Bridra	Tunnel Engg	Dhanpat Rai s. Sons 1682, Naisarak, New Delhi-110006

(CE622) CONSTRUCTION (ADVANCED)

1. RATIONALE: 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

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE622 CONSTRUCTION (ADVANCED)	L	T	P	C	TH	TM	TW	PR/OR	150
	3	-	2	5	75	25	25	25	

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

*L-Lecture; T - Tutorial; P - Practical; C- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*

***PR/OR** - End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1	**DEEP TRENCH EXCAVATIONS**

Introduction, basement excavations -perimeter trench methods, raking, struts, cofferdams ,diaphragm walls.

Unit 2	**TALL CHIMNEYS, SILOS, ETC**

General aspects of construction. Form-work -Slip-forms, jump-forms. Lining.

Unit 3	**BRIDGE CONSTRUCTION TECHNIQUES**

Introduction. Construction techniques-Fully supported on staging, partly supported on staging. Cantilever construction. Arch rib constructed with cable supports. Continuous deck construction with movable forms. Incremental push launching method. Form-work and false-work.

Unit 4	**SPECIAL CONCRETING OPERATIONS**

Introduction. Short-crete, pump-crete, grouting, guniting, tremie concreting, mass concreting. Sources.

Unit 5	**CLADDINGS**

Definition. Functions. Requirements. In- fill panels. Types of claddings -Asbestos cement sheet wall cladding. Sheet metal wall cladding. Brick and block walling. Jointing- Mastics and sealant, types and requirements.

Unit 6	**FACTORY BUILDINGS**

Introduction. Roofs- North light roofs, Monitor roofs, Special type of steel roofs, Lattice truss, Portal frame, Shell roof.

Unit 7	**PREFABRICATED CONSTRUCTION**

Introduction. Advantages. Areas of application, Various pre-fabricated units. Constructional details.

Unit8	**REINFORCED EARTH CONSTRUCTION**

Introduction. Advantages. Reinforcing materials, characteristics. Application areas. Constructional-details.

Unit 9	DEMOLITION OF STRUCTURE

Introduction. Safety precautions. Demolition-techniques -Hand demolition, push arm demolition, deliberate collapse demolition, demolition ball techniques, wire rope pulling demolition, demolition by explosives, other methods

Unit 10	SPECIAL ASPECTS OF CONSTRUCTION:

Dampness sources and effects, water proofing,terrace, parapets,toilets, damp preventions.

Acoustics in building: Use of acoustic materials, acoustics defects and remedial measures.

Fire proofing: Use of Fire proofing materials, planning to minimize fire hazards in multi-storeyed, public building.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Deep Trench Excavations	3	06
2	Tall Chimneys, Silos,	4	06
3	Bridge Construction Techniques	5	09
4	Special Concreting Operations	5	09
5	Claddings	5	09
6	Factory Buildings	4	06
7	Prefabricated Construction	5	06
8	Reinforced Earth Construction	4	06
9	Demolition Of Structure	5	06
10	Special Aspects of Construction:	8	12
		48	75

5. TERM WORK & PRACTICALS
Term work shall include following:
1. Study tour if possible with written report on the same of 10-25 pages
    2. Written assignments on the above.

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	Chudley	Construction Technology(vol. 1 to 4)	Longman Scientfic TechnicalPublications
2	R, Barry	Construction of Buildings (vol.1 to 4)	The English Language London
3	W. B. Mackey	Building Construction(vol.1 to 4)	The English Language London
4	D. Johnson Victor	Essentials of Bridge Engineering	Oxford&IBH Publishing Co.PVt.LTD
5	Robert Bowen	Ground water	
6	Neville	Concrete technology	Newyark longman Scientfic
7	M . S. Shetty	Concrete technology	S.Chand and Company Ram Nagar New Delhi
8	S. N. Manohar	Tall chimney design and construction	Tata Mc Graw-Hill New Delhi

(CE625) MAINTENANCE AND REPAIRS OF CIVIL STURCTURES

1. RATIONALE: 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 repairs and maintenance of various civil engineering structures.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
CE625 MAINTENANCE AND REPAIRS OF CIVIL STURCTURES	3	-	2	5	75	25	25	25	150

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*
Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*

***PR/OR** - End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   **PRINCIPLES OF REPAIRS AND MAINTENANCE**

Necessity for repairs and maintenance.

Sources and causes of deterioration and decay of structures.

Adaptation

- Part of structures for partial use
- Structures for alternate use.
- Temporary arrangements pending repairs and maintenance.

Classification of repairs and maintenance.

- Routine and
- Emergency
- Annual

Maintenance management

- Necessity for management.
- Organisation structure of Specialized Repairs and Maintenance Firm.
- Direct Contract, sub-contract and labour-contract.
- Health and safety requirements.

Planning and Design consideration

- How to plan for repairs and maintenance.
- suitable materials
- Selection and Availability of suitable materials.
- Estimate for maintenance.

Access for maintenance.

Unit 2   BUILDINGS

Defects, causes and maintenance of

- Structural Elements- Foundation, RCC-frame parts(beam, column, slab, stairs), walls, roofs,
- Non-Structural Elements- doors, windows, Grillage,
- Surface-finishes- Plastering, painting, waterproofing.
- Building services- Light, ventilation, electricity, plumbing, water tanks, drainage, lifts.

Maintenance of multi-storeyed buildings-

Introduction to Non-destructive testing

Safety and special precautions.

Fire protection.

Unit 3   WATER SUPPLY AND SEWERAGE SYSTEMS

Need for Repair and Maintenance.

Inspection and safety precautions.

Leakage and losses in pipes.

Cleaning of water tanks.

Repair and Maintenance of piping used in water supply and sewage system.

Repair and Maintenance of treatment plants.

Repair and Maintenance of pumps and appurtenances.

Unit 4   ROADS

Defects, and their causes

Inspection practices.

Repair methodology.

Repairs and maintenance pavement, permanent-way, shoulders, pot holes,

subsidence of roads

special machinery

Unit 5   **IRRIGATION STRUCTURES** Problem identification Causes of inefficient working of bandharas, dams, canals, gates and weirs. Silt removal and strengthening of canal banks Algal and weed control Maintenance of service roads. Routine inspection. Special repairs, such as :cement grouting, soil stabilisation, repairs of Filters, pitching etc. Silt removal and strengthening Repair of sluice gates,
Unit 6   **MARINE STRUCTURES** Types of maintenance works, brief description, necessity and method. Inspection and testing of marine structures Dredging of docks, jetties, dry-docks, harbours Introduction to Non-destructive testing Repair and rehabilitation of marine structures Planning guidelines for maintenance of ocean structures Structural health monitoring of ocean structures Shore protection works
Unit 7   **OTHER STRUCTURES** Defects and their causes of -rails, permanent-way and level crossing, earth retaining works, airport runways and aprons, trusses and steel structures, tunnels and underground shafts, bridges. Inspection practices, Inspection of defects, Duties and responsibilities of inspectors. Repair and maintenance methodology

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Principles Of Repairs And Maintenance	8	10
2	Buildings	12	15
3	Water Supply And Sewerage Systems	10	15
4	Roads	6	10
5	Irrigation Structures	4	10
6	Marine Structures	4	10
7	Other Structures	4	5
		48	75

5. TERM WORK & PRACTICALS
Term work shall consist of

- Health and safety requirements,
- Schedule,
- List of materials,
- List of tools and equipment and special equipment (including brief description of working)
- Check list for faults,
- Check list for maintenance and repairs

for the following:

1. Masonry structures
2. RCC structures
3. Steel structures
4. Roads
5. Railways
6. Canals
7. Docks and jetties
8. Earth retaining works
9. Shore protection works
10. Airports
11. tunnels
12. Dams and bandharas

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1		Indian standard code of practice for maintenance of canal	
2	Johnson Victor	Bridge Engineering	
3	Khanna & Justo	Highway Engineering	
4	S. K. Garg	Water supply Engineering	
5	IS: 12054:1987	Code of practice for application of silicon based water repellent	
6	IS 4839 Part I Part II Part III	 (unlined canals) (lined canals) (Canals drains outlets etc.)	
7	S. K. Hussain	Water supply & Sanitary Engineering	
8	Y. K. Raina	Concrete for construction Facts & Practice	
9	IS: 4365: 1967	Code of practice for application of bitumen mastic for water-proofing of roofs	
10	IS: 7198: 1974.	Code of practice for damp-proofing using bitumen mastic	
11	P.K. Guha	Mainrainence and repairs of buildings	New Central Book Agency, 8/1 Chintamani Das Lane, Calcutta 700009

CE626 Solid Waste Management

1. RATIONALE: Solid waste management is a pressing issue, and lack of know how in solid waste management is a great concern for all the Local Self Govt. units & community Additionally, there is still little awareness on the importance of sound environmental management within the majority of the population. The course on Solid Waste Management gives the student an overview of municipal solid waste management including collection, transfer, transport, and disposal. Methods of processing, basic disposal facilities, disposal options, and the environmental issues of solid waste management will be covered in this course. In addition, this course provides the student with relevant information about municipal solid waste reduction and on hazardous waste management. This course is therefore an essential course for diploma programme in Civil Construction Engineering.

6. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CE516 Interior Design	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

3.DETAILED COURSE CONTENTS

Unit 1 SOURCES AND COMPOSITION OF MUNICIPAL SOLID WASTE

1.1 Introduction

1.2 Sources of solid waste

1.3 Types of solid waste

1.4 Composition of solid waste and its determination.

1.5 Types of materials recovered from MSW.

Unit 2 PROPERTIES OF MUNICIPAL SOLID WASTE

2.1 Physical properties of Municipal Solid waste

2.2 Chemical properties of Municipal Solid Waste

2.3 Biological properties of Municipal Solid Waste

2.4 Transformation of Municipal Solid Waste

Unit 3 SOLID WASTE GENERATION AND COLLECTION

3.1 Quantities of Solid Waste

3.2 Measurements and methods to measure solid waste quantities.

3.3 Solid waste generation and collection.

3.4 Factors affecting solid waste generation rate.

3.5 Quantities of materials recovered from MSW

Unit 4 HANDLING, SEPARATION AND STORAGE SOLID WASTE

4.1 Handling and separation of solid waste at site. Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices for material separation.

4.2 Waste handling and separation at Commercial and industrial facilities.

4.3 Storage of solid waste at the sources.

Unit 5 PROCESSING OF SOLID WASTE

5.1 Processing of solid waste at residence e.g. Storage, conveying , compacting, Shredding, pulping , granulating etc.

5.2 Processing of solid waste at Commercial and industrial site.

Unit 6 DISPOSAL OF MUNICIPAL SOLID WASTE

6.1 Combustion and energy recovery of municipal solid waste, effects of combustion, undesirable effects of Combustion.

6.2 Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design landfill operation, use of old landfill.

6.3 Differentiate sanitary land fill and incineration as final disposal system for solid waste.

6.4 Biochemical processes: Methane generation by anaerobic digestion, composting and other biochemical Processes.

Unit 7. HAZARDOUS SOLID WASTE

7.1 Definition, identification and classification of hazardous solid waste.

7.2 Characteristics: Hazardous waste toxicity, reactivity, infectiousness, flammability, radioactivity, corrosiveness, irritation, bio-concentration, genetic activity, explosiveness.

7.3 Bio-medical waste, its sources, generation, storage, transportation and Disposal.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
6	Sources and composition of Municipal Solid Waste	6	8
7	Properties of Municipal Solid Waste	6	8
8	Solid Waste Generation and Collection	6	11
9	Handling, Separation and Storage of Solid waste	6	12
10	Processing of Solid Waste	8	12
11	Disposal of Municipal Solid Waste	8	12
12	Hazardous Solid Waste	8	12
	TOTAL	48	75

5. TERM WORK & PRACTICALS

Practical shall include Journal containing the following

1. Survey the MSW of your locality and identify its sources and write composition of MSW.
2. Survey your locality and based on it suggest methods of solid waste collection.
3. Survey your locality and based on it suggest suitable methods of handling, separation and storage of solid waste.
4. Identify Compare & discuss the methods of processing different types of solid waste (search internet for latest methods).
5. Identify methods of hazardous waste disposal during a site visit and follow safety precautions.
6. Report of visit to solid waste treatment plant.
7. Prepare 2 charts and 2 models of different method of treatment of MSW.

6. LEARNING RESOURCES

Sr.No.	Author	Title of Books	Publication
1	George Tchobanoglous and Hillary Theisen Samuel Vigil.	Integrated solid waste management	McGraw Hill
2	P Aarne Vesiling	Solid waste management	
3	Micahael E Henstock Butterworths, Ann Arbor Science	Disposal and recovery and municipal solid waste	
4	Environmental engineering	Mackenzie L Davis, David A Cornwell	
5	Software/Learning Websites	En.wikipedia.org/wiki/waste management http://www.cyen.org/innovaeditor/assests/ Solid%20waste%20management.pdf http://www.ilo.org/oshenc/part-vii/environmental pollution-control/item/514-solid-waste-mangement and-recycling www.houstontc.gov/solid waste	

(CE627) AIRPORT PLANNING & DESIGN

1. RATIONALE: Airport Engineering involves design and construction of a wide variety of facilities for landing, take-off movement on ground and handling of passengers, This also is an essential and important area of activity for the socio-economic development of any region. The Civil Engineer is actively involved in the planning and execution of transportation net works such as roads, railways, airports and related structures viz. bridges, tunnels, docks and harbours. This course content on **airport planning & design** has been designed to provide the students with sufficient understanding of different operations , execution and maintenance of various components in airport .

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
CE627 Airport Planning & Design	3	-	2	5	75	25	25	25	150

Minimum passing %: Theory 40%   *Duration of theory paper: 3 Hrs.*

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENTS

UNIT 1 INTRODUCTION TO AIRPORT PLANNING AND DESIGN
Air transport and the national economy; Types of airport studies; elements of airport planning studies. History of Airport Engineering, Aircraft Technology in Airport Engineering, Aeronautical Terms, Aircraft types & general characteristics, Operating costs , Aircraft Weight definitions ,Payload & range, Airport Classification
UNIT 2 FORECASTING TECHNIQUES
Demand parameters for airport design; Airport Master Planning, Forecasting in Airport Planning (data requirements , expert judgement , trend extrapolation, nonlinear extrapolation) Methodologies and Levels of forecasting; Market study, Market share/top-down models
UNIT 3 AIR TRAFFIC CONTROL AND AIRPORT CAPACITY
Structure of air space; Airways and navigation systems; Air Traffic Control Systems. Air Cargo Terminals Airport Capacity (Practical capacity and ultimate capacity, Gate capacity) Air separation criteria; Queuing theory; Space time diagrams; FAA charts;
UNIT 4 AIRPORT AND AIRFEILD CONFIGURATION
Aircraft characteristics related to airport design –(Trends in size, speed, productivity; Payload, range, runway requirements), Principles of Airport configuration, Airport Configuration Design procedure, Runway configuration, Runway types and capacities, Runway length, Takeoff & landing distance;

Relation of runway & terminal Runway and exit taxiway design (longitudinal and transverse design) Holding bays; bay design, Holding aprons, apron design Analysis of wind data and runway orientation (Wind analysis concepts), Wind Rose Analysis/Site Selection, Obstruction requirements Airport Geometric Design, Geometric Design (Runways) Geometric Design (Taxiways/Aprons) Standards; runway spacing and exits; taxiways and taxi-lanes; apron area, Airfield Capacity and Delay, hanger design, Lighting and Marking.	
UNIT 5 TERMINAL SYSTEM DESIGN Terminal Design considerations; Terminal concepts; Design of terminal components; Passenger and baggage processing times, Passenger and baggage processing system; Airport Terminal Configurations, Terminal Design, Queuing Theory to Estimate Delay, airport parking design.	
UNIT 6 DESIGN OF AIRPORT PAVEMENTS Pavement Design (Flexible Pavement), Pavement Design (Rigid Pavements)	
UNIT 7 AIRPORT SECURITY AND OTHER FACTORS Environmental Factors, Land use compatibility, Land use planning, Social factors, Noise Modeling, Noise Concepts (Day-night average sound level, Qualitative noise factors) Airport security, Runway protection Airport Financing and Economic Analysis, Policy Alternatives/Economics	

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours Per Semester	Marks
1	Introduction To Airport Planning And Design	6	12
2	Forecasting Techniques	6	9
3	Air Traffic Control And Airport Capacity	6	9
4	Airport And Airfeild Configuration	12	18
5	Terminal System Design	8	12
6	Design Of Airport Pavements	6	9
7	Airport Security And Other Factors	4	6
		48	75

5. TERM WORK & PRACTICALS
Practicals shall include following:
1. At least two Study assignments on each unit
    2. Plotting a wind rose diagram.
    3. At least 4 drawing sheets with airport master-plan and runway configurations.
    4. At least 1 Problem each on airport pavement design (flexible pavement and rigid pavement).

6. LEARNING REFSOURCES

S. No.	Author	Title of Books	Publication
1	Robert Horonjeff, Francis McKelvey, William Sproule and Seth Young	Planning and Design of Airports: 5th Edition	McGraw-Hill 2010
2	Norman J. Ashford, Saleh Mumayiz, Paul H. Wright	Airport Engineering: Planning, Design, and Development	2011
3	Alastair Gordon	Naked Airport	2008
4	Marcus Binney	Airport Builders	1999
5	Brian Edwards	The Modern Airport Terminal: New Approaches to Airport Architecture	2005
6	Walter Hart	The Airport Passenger Terminal	1992

(IE6**) INSTITUTIONAL ELECTIVE

1. RATIONALE :

It has been observed that the curriculum prescribed, is many times out of context of Industry, on account of the pace with which technology development is taking place at Industry end. Due to this, gap exists between the Industry requirement of manpower and manpower produced by the Polytechnics. Board takes some time to incorporate the development of technology in the curriculum and many a times technology becomes outdated when it is incorporated in the curriculum. Further the expertise to train students as per Industry current requirement is available at the institute, but the same cannot be taught to students, as it is not a part of curriculum.

To address this situation, Board has decided to permit Institutions affiliated to Board, to identify such technologies or other aspects and teach the same to the students as an elective subject called "Institutional Elective". Through this Institutional Elective subject, Institutions will be able to cater to the requirements of Industry by identifying their immediate requirement and prepare the students for the requirement by developing the curriculum in consultation with the Industry.

As many a time's same subject may not be offered more than one or two years, a non conventional way of teaching – learning may be required to be adopted. Participation of Industry experts, guest lecturers, visit to Industry, exploring the knowledge available on net, etc may be essential to achieve the objectives.

2. TEACHING AND EXAMINATION SCHEME :

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory		Practical		
IE6**	L	T	P	C	TH	TM	PR/OR	TW	
INSTIUTIONAL ELECTIVE	3	-	2	5	75	25	25	25	150

3. DETAILED COURSE CONTENTS :

a) Curriculum shall be drafted by the concerned department by interacting with Industry counterpart in regards to the Newer Technology required to be transferred for purpose of Teaching /Learning process.

b) Department shall work out the modalities of execution of the curriculum at Industry/Institute Level.

c) Curriculum shall be forwarded to Board for approval before its implementation.