

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/AU/PK/MT/EE****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : AM 1301****COURSE TITLE : ENGINEERING MECHANICS****PREREQUISITE : NIL****TEACHING SCHEME: TH :03; TU :01; PR :02; TOTAL CREDITS: 06 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only.)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ • RATIONALE:-**

Study of this subject develops understanding of effect of force on a body. It helps in analytical and graphical solutions to problem related to forces acting on body. It also helps in understanding concept and application in Equilibrium, friction, centroid.

It also helps in understanding concept of work, power and energy, kinetics and motion of bodies and their application in solving problems. Study of simple machines gives idea about input, output, efficiency and friction in machine.

This is very useful in study of subjects at higher level like strength of materials, theory of structures etc. It helps in forming base for understanding all the courses, which are related to mechanics.

❖ OBJECTIVES :

The students will be able to

1. Understand concept and application of forces.
2. Solve problems related to equilibrium of forces.
3. Understand friction and its effects.
4. Find out centroid and C.G. of given lamina and body respectively.
5. Understand the concept kinematics, kinetics and its applications.
6. Understand the concept of simple lifting machines

❖ SKILL:

The student should be able to acquired following skills

1. The student should be able to verify theorems and determine forces with the help of apparatus.
2. The student should be able to determine velocity ratios of different types of lifting Machines
3. The student should be able to use Graphics-Statics principles for solving problems

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1	INTRODUCTION		02	01
	1.1	Definition of engineering mechanics, necessity and classification of engineering mechanics. Concepts: Space, time, particle, body, rigid body, mass, weight, scalar and vector quantity.		
	1.2	Units of measurement (SI units): Fundamental units and derived units.		
2	FORCES		12	07
	2.1	Concept of force, definition of force, unit of force, effects of force, Characteristics of force.		
	2.2	System of forces. Principle of transmissibility of force.		
	2.3	Composition of forces & Resolution of forces (Two dimensional), Orthogonal and Non Orthogonal components of a force. Resultant force. Resultant of concurrent, non-concurrent and parallel forces, Law of parallelogram of forces: limitations and its applications.		
	2.4	Definition of moment, types of moments. Law of moment, definition of couple, types of couple, properties of couple, Varignon's theorem of moments and its applications.		
3	EQUILIBRIUM		08	06
	3.1	Definition of equilibrium, analytical conditions of equilibrium, free body diagram.		
	3.2	Lami's Theorem : limitations and its applications.		
	3.3	Equilibrium of concurrent, non-concurrent and parallel forces. Definition of Beam, span, types of beams, types of supports, types of loading: point load and UDL. Analytical method to calculate reactions at support for point load and UDL on simply supported and overhanging beams.		
4	GRAPHIC STATICS		06	04
	4.1	Introduction to graphic statics, graphical representation of force, Bow's notation.		
	4.2	Space diagram, force diagram, polar diagram & funicular polygon, Graphical conditions of equilibrium.		
	4.3	Laws of forces: triangle law of forces, law of polygon of forces Problems related to concurrent, non-concurrent and parallel forces. Finding reactions of simply supported and overhanging beams for point load and UDL.		
5	FRICTION		08	05
	5.1	Concept of friction and its importance in engineering, types of friction, laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction.		
	5.2	Equilibrium of bodies on level surface & inclined plane subjected to parallel and inclined forces to the plane. (No ladder friction).		
6	CENTROID AND CENTRE OF GRAVITY:		08	06
	6.1	Definition of centroid and centre of gravity, difference between centroid and centre of gravity. Locating centroids of regular figures such as triangle, rectangle, circle, semi circle, quarter circle.		
	6.2	Locating centroid of composite figures.		

	6.3	Locating centre of gravity of solid bodies like cylinder, cone, sphere, hemisphere and composite solids		
	6.4	Locating centre of gravity of composite solids.		
7	RECTILINEAR MOTION		06	03
	7.1	Definition of kinematics, rectilinear motion, displacement, speed, velocity, acceleration, Equations of motion for uniform acceleration. (simple problems)		
8	ANGULAR MOTION		06	03
	8.1	Introduction, Angular displacement, Angular velocity, Angular acceleration, equations of uniform angular acceleration, relation between rectilinear and angular motion (simple problems)		
9	KINETICS:		08	04
	9.1	Definition of kinetics, mass, momentum, impulse. Newton's laws of motion		
	9.2	Law of conservation of momentum. Application of momentum and impulse (Recoil of gun).		
10	WORK, POWER AND ENERGY:		08	04
	10.1	Definition of work, unit of work, graphical representation of work.		
	10.2	Definition of power. unit of power. Types of engine powers.		
	10.3	Definition of energy, unit of energy. Law of conservation of energy.		
	10.4	Application of work, power and energy to simple problems in engineering.		
11	SIMPLE LIFTING MACHINES:		08	05
	11.1	Concept of simple lifting machine, uses of machine, definition of load, effort, mechanical advantage, velocity ratio, efficiency of machines, reversible and non-reversible machines.		
	11.2	Ideal machine, friction in machine, law of machine, maximum mechanical advantage and efficiency.		
Total			80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES:

S.No.	Title of Practical/Lab.Work	Hrs.
1.	GROUP : A (Any THREE Experiments)	
1.1	Verification of law of polygon of forces.	2
1.2	Verification of Lami's Theorem.	2
1.3	Study of forces in the members of jib crane.	2
1.4	Verification of equilibrium of parallel forces using beam reaction apparatus.	2
1.5	Comparison of co-efficient of Friction between different surfaces such as Wood and wood, Wood and glass, Wood and metal	2
2.	GROUP : B (Any SEVEN Experiments)	
2.1	To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel	2
2.2	To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack	2
2.3	To find the M.A., V.R., Efficiency and law of machine for Two Sheave Pulley Block	2
2.4	To find the M.A., V.R., Efficiency and law of machine for Three Sheave Pulley Block	2
2.5	To find the M.A., V.R., Efficiency and law of machine for Single purchase Crab	2
2.6	To find the M.A., V.R., Efficiency and law of machine for Double purchase Crab	2

2.7	To find the M.A., V.R., Efficiency and law of machine for Differential Pulley Block	2
2.8	To find the M.A., V.R., Efficiency and law of machine for Worm and Worm Wheel	2
2.9	To find the M.A., V.R., Efficiency and law of machine for Gear Train	2
3	GROUP : C – Three Half Imperial Drawing Sheets consisting of problems on:	
3.1	Determination of Resultant of Co-planer concurrent Forces (Two problems)	4
3.2	Determination of Resultant of Co-planer Non Concurrent Forces (Two problems)	4
3.3	Determination Beam Reaction for Vertical Point Load and UDL. (Two problems)	4
C.	TUTORIALS	
SR. NO.	PRACTICE PROBLEMS BASED ON FOLLOWING TOPICS	HOURS
1	Forces, Equilibrium	4
2	Friction , Centroid and centre of gravity	4
3	Rectilinear motion , Angular motion	4
4	Kinetics , Work, Power and Energy , Simple lifting machines:	4

❖ **ASSESSMENT OF LABORATORY EXPERIENCES:**

Continuous assessment of Term Work and Term end oral/ practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. **Lecture method**
2. **Improved lecture method.**
3. **Q & A technique.**
4. **Demonstration**

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT** : Text books/Reference books/Manuals/Journals.
2. **NON PRINT** : CDs / PPT / Transparencies / Charts / Models

D. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	03	03	---	---	03
2.	Forces	18	02	04	12	18
3.	Equilibrium	12	02	02	08	12
4.	Graphic Statics	09	03	00	06	09
5.	Friction	12	02	02	08	12
6.	Centroid And Centre Of Gravity	12	02	02	08	12
7	Rectilinear Motion	09	03	02	04	09
8	Angular Motion	09	03	02	04	09
9	Kinetics	12	02	02	08	12
10	Work, Power And Energy	12	02	02	08	12
11.	Simple Lifting Machine	12	02	02	08	12
Total		120	26	20	74	120

E. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Applied Mechanics	R. S. Khurmi. S.Chand	8121906512
2.	Engineering Mechanics	F. L. Singer	
3.	A text book of Applied Mechanics	S.Ramamrutham Dhanpatrai and co. New Delhi	8187433515
4.	Engineering Mechanics	V.K.Kumawat Tech Max Publications, Pune	8184073771
5.	Engineering Mechanics (Statics & Dynamics)	M.S.Palanichamy and S.Nagan Tata McGraw Hill	0070588309
6.	Engineering Mechanics	S.S.Bhavikatti and K.G.Rajashekharappa New Age International (P) Ltd. Publishers.	

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	A. P. Waghmare	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
2.	R. N. Nibudey	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	S. S. Dikey	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

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COURSE CURRICULUM**PROGRAMME:** DIPLOMA IN CE/ME/AU/PK/MT**LEVEL NAME:** BASIC TECHNOLOGY COURSES**COURSE CODE:** WS 1301**COURSE TITLE:** WORKSHOP PRACTICE**PREREQUISITE:** NIL**TEACHING SCHEME:** TH :00; TU :00; PR :04; TOTAL CREDITS: 04 (Hrs/Week)

(1 CREDIT = 1 CLOCK HR.)

EVALUATION SCHEME:

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	---	---	---	NIL	50@	NIL	50
MIN.	---	---	---	---	20	---	20

(# - External & Internal Assessment ; @ - Internal Assessment only)

TIME ALLOTTED FOR TERM EXAM : ---**TIME ALLOTTED FOR PROGRESSIVE TEST** : ---❖ **RATIONALE :**

The knowledge of different hand tools and basic processes such as Smithy, Carpentry Fitting, Filling, Welding and Plumbing is essential for technicians.

❖ **OBJECTIVES : The students will be able to -**

- Know different hand tools.
- Use these hand tools.
- Know various skills and techniques used in various trades.
- Apply these techniques in manufacturing processes.
- Develop the skills in manufacturing processes.

❖ **SKILLS :**

- To develop attitude towards safety
- To develop ability to select appropriate tools
- To develop ability to handle tools.
- To develop ability to operate the machines.

CONTENTS :**A. THEORY : NIL**

SR. NO.	CHAPTER	MARKS	HOURS
- NIL -			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Fitting: One job individually of male-female fitting.	10
2.	Smithy: One job individually involving cutting, bending & drawing down.	12
3.	Carpentry: One job individually (Any one wooden joint).	12
4.	Welding: One composite job individually involving lap/butt joint.	10

5.	Plumbing: One job individually involving pipe bending & pipe threading.	12
6.	Sheet Metal: One job individually involving development & joining	8
	Total	64

❖ ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work .

(The student shall submit a journal and jobs on above work at the end of term.)

SUGGESTED IMPLEMENTATION STRATEGIES :

1. Demonstration
2. Models/ sample jobs
3. Performance on actual machines to prepare jobs.

SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Manuals/Journals.
2. **NON PRINT** : CDs / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Job Area	Weightage (Marks)	Distribution of Marks			
			Cognitive	Psychomotor	Affective	Total
1.	Fitting	10	02	07	01	10
2.	Smithy	8	02	05	01	08
3.	Carpentry	10	02	07	01	10
4.	Welding	10	02	07	01	10
5.	Plumbing	6	01	04	01	06
6.	Sheet metal	6	01	04	01	06
Total		50	10	34	06	50

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	A course in Workshop Technology	B.S.Raghuwanshi; Dhanpat Rai sons, New Delhi ; 2006	
2.	Elements of Workshop Technology	Hajra; Choudhary; Media Promoters & Publishers Mumbai.	
3.	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta J.K., <u>R.S.Khurmi</u> S.Chand & Co. New Delhi	81-219-3092-8
4.	Workshop practice manual	V.Kapoor; Dhanpat Rai & sons, New Delhi ; 2006	

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Shri A.W.Wankhade	Work shop superintendent	Govt.Poly. Nagpur
2.	Shri.G.F.Potbhare	Principal	NIT Polytechnic, Nagpur

(Member Secretary PBOS)

(Workshop Supt.)

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COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AU/MT/PK.****LEVEL NAME : BASIC TECHNOLOGY COURSE****COURSE CODE : ME 1301****COURSE TITLE : ENGINEERING GRAPHICS****PREREQUISITE : NIL****TEACHING SCHEME: TH :02; TU :00; PR :04; TOTAL CREDITS: 06 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	---	---	---	50#	25@	NIL	75
MIN.	---	---	---	20	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : ---****TIME ALLOTTED FOR TERM END PR EXAM. : 02 HRS.****❖ RATIONALE :**

This is classified as Basic Technology Course. It describes the fundamentals, facts, concepts, principles and techniques of Engineering Graphics. The course illustrates techniques of drawing in an engineering field. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. It helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. It is useful in understanding the Basic Technology and Applied Technology Courses. The course illustrates the technique of graphics in actual practice. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

❖ OBJECTIVES : The student shall be able to -

- Draw geometrical figures, curves, sketches etc.
- Coordinate the views of an object by using principles of orthographic projection.
- Understand the concept of isometric projection.
- Understand the techniques of application of drawing skills to actual practice.
- Be familiar with various drawing codes, conventions and symbols as per Bureau of Indian Standards.

❖ SKILLS :

1. To develop ability to read & interpret the drawings.
2. To develop awareness of using IS convention for graphics.
3. To develop ability to visualize the given objects in space & reproduce the same.
4. To develop attitude of accuracy, precision and cleanliness in drawing the objects.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER	MARKS	HOURS
1.	INTRODUCTION TO DRAWING	06	04
	1.1 Use of different drawing instruments and equipment		
	1.2 Types of letters and numbers (single stroke vertical and inclined letters and numbers only)		
	1.3 Conventions of lines		
	1.4 Scales (reduced, enlarged and full size)- Plain scale, diagonal scale, comparative scale, Vernier scale and scale of Chords		
	1.5 Redrawing		
	1.6 Loci of points		
2.	ENGINEERING CURVES	10	06
	2.1 To draw an ellipse by: i) Directrix - focus method ii) Arcs of circles method iii) Rectangle method iv) Concentric circles method		
	2.2 To draw parabola by i) Directrix - focus method ii) Rectangle method		
	2.3 To draw hyperbola by i) Directrix – focus method ii) Passing through a given point with reference to given asymptotes iii) Transverse axis focus method		
	2.4 To draw involute of circle and polygon of maximum six sides		
	2.5 To draw cycloid, epi-cycloid and hypo-cycloid		
	2.6 To draw Archimedean spiral & Helix		
3.	ORTHOGRAPHIC PROJECTIONS	12	08
	3.1 Introduction to orthographic projections		
	3.2 First angle and Third angle method of projections		
	3.3 Conversion of simple pictorial views into orthographic views and dimensioning techniques as per IS SP-46		
4.	ISOMETRIC PROJECTIONS	10	05
	4.1 Isometric scales,		
	4.2 Isometric views of simple object (plane surfaces, Planting surfaces, rectangular, V, Trapezoidal slots)		
5.	PROJECTIONS OF STRAIGHT LINES	06	04
	5.1 Projections of straight lines inclined to one reference plane and parallel to the other – limited to both ends in one quadrant.		
6.	FREE HAND SKETCHES	06	05
	6.1 Types of threads – Vee and square threads, left hand and right hand threads		
	6.2 Bolts – square and hexagonal bolts, eye bolt		
	6.3 Types of nuts – square, hexagonal, wing, capstan, cap, flanged, ring and dome nut		
	6.4 Locking arrangement – lock or check nut, split pin, slotted nut, castle nut, sawn nut and grooved nut		
	6.5 Foundation bolts- Eye foundation bolt, Rag foundation bolt, Lewis foundation bolt and Cotter foundation bolt		
	6.6 Riveted joints – Lap and butt joints with maximum three rows per plate		
Total		50	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Introduction to drawing - lines, lettering, numbers are to be drawn on sketch book only and one problem each of topics and two problems of topic 1.5 of chapter 1 on sheet (01 Sheet)	08
2.	Engineering Curves – four problems, one from topic 2.1, one from topic 2.2 & 2.3, one from topic 2.4 & 2.5 and the fourth from topic 2.6 of chapter 2. (01 Sheet)	12
3.	Orthographic Projections – one problem using first angle method of projection and another using third angle method of projection (01 Sheet)	12
4.	Isometric Projections – one problem with plane surfaces & other with slot, slanting surfaces (using natural scale and isometric scale) (01 Sheet)	12
5.	Projections of Straight Lines – four problems, two using first angle method of projection and the other two using third angle method of projection (01 Sheet)	12
6.	Free Hand Sketches – any ten sketches covering all the topics under chapter 6 (01 Sheet)	08
Total		64

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work and Term end practical examination (\$).

AGB – Attendance and general behavior: 02

RSC – Regularity and sheet completion: 02

LWC – Line work and cleanliness: 03

OR – Oral :03

Total: 10

Note :- Total marks are converted into out of 25 and are considered as the term work marks.

#- For term end external practical examination there will be a paper for 50 marks and 02 Hrs duration; external examiner will set a paper based on above content. Answer books (drawing sheets of half imperial size) shall be assessed by external examiner only.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. **Lecture method**
2. **Improved lecture method.**
3. **Q & A technique.**
4. **Demonstration**

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE : FOR PR. EXAMINATION

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction to Drawing	09	02	05	02	09
2.	Engineering Curves	15	04	08	03	15
3.	Orthographic Projections	18	04	10	04	18
4.	Isometric Projections	15	04	08	03	15
5.	Projections Of	09	02	05	02	09

	Straight Lines					
6.	Free Hand Sketches	09	02	05	02	09
Total		75	18	41	16	75

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	IS SP-46 Engineering Drawing Practice for School and College	Indian Standards Institution	8170610192
2.	Engineering Drawing	N.D.Bhatt Charotar Publishing house	----
3.	Machine Drawing-	N.D.Bhatt ,Charotar Publishing house	978-93-80358-17-8
4.	A workbook on Engg. Drawing	TTTI, Bhopal	----
5.	Engineering Drawing	R. K. Dhawan , S..Chand&co.	----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Mr. Anil M. Onkar :	M.D.	Onkar Furnitech MIDC Nagpur, Indutralist
2.	Mr.D.S.Dhakate	Superintending engineer	MSEB,CTPS Chandrapur.
3.	Prof. O.V. Sarode	I/C HMED,	GP Nagpur.
4.	Prof. M.P. Daniel	I/C HMED 2 nd Shift,	GP Nagpur.
5.	Prof. M.G. Thote	LME	GP Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE1301****COURSE TITLE : BUILDING DRAWING****PREREQUISITE : ME1301 ; ENGG.GRAPHICS****TEACHING SCHEME: TH :02; TU :00; PR :04; TOTAL CREDITS: 06 (Hrs. per Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	50@	25#	175
MIN.	32	--	40	---	20	10	--

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 04 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 02 HRS.****❖ RATIONALE :**

Drawing is the language of communication between various agencies in construction work. At each stage of construction, different types of drawing are necessary. This course is intended to develop and inculcate basic drawing skills so as to enable students to read and interpret the drawing and to enable them to understand the basic aspect of building planning, design and the working drawings. The course has close relationship with other courses i.e. Building construction and Estimating and costing. The drawing to be drawn by the students must have approach adopted in the field and according to the code requirements and Bye-laws of the sanctioning authority.

❖ OBJECTIVES :**After completing this course students will be able to–**

- Read the working drawings.
- Interpret the drawings.
- Understand the new trends in drawing.
- Understand Methods and procedure of preparing drawings.
- Follow the I.S specifications.
- Know about Rules, regulation and Bye-laws of local sanctioning authorities.

❖ SKILLS : After completion of this course, students shall acquire following skills-

1. Skill of reading and interpreting the drawings.
2. Preparing the drawings for various types of residential and non-residential buildings.
3. Building planning and designing within framework of Building Bye-laws.
4. Preparing the required working drawings.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	INTRODUCTION		04	04
	1.1	Concept for I.S specification for drawing.		

	1.2	Symbols and notations as per BIS 696 in Civil Engg		
	1.3	Scales used for preparing drawing.		
	1.4	Development of line plan.		
	1.5	Procedure for development of detailed plan.		
	1.6	Front elevation and sectional elevation.		
	1.7	Other requirements:- Schedule of doors and windows, Construction notes, Area statement, Site plan, Location plan, Foundation plan etc.		
	1.8	Concept of measured drawing.		
2.	AGENCIES IN CONSTRUCTION WORK		06	04
	2.1	Agencies in construction work, their role		
	2.2	Owner, Architect, Structural Designer, Contractor, Interior Designer, Specialists.		
	2.3	Inter relation of various agencies right from planning up to final completion of work.		
3.	PLANNING OF RESIDENTIAL BUILDINGS		36	10
	3.1	Principals of planning –aspect, prospect, grouping, roominess, elegance, circulation, privacy		
	3.2	Furniture layout, economy and sanitation		
	3.3	Orientation		
	3.4	Other requirements:- Light and ventilation, Climate and its effect, Sun diagram.		
	3.5	Planning of residential building from given data.		
4.	PLAN SANCTIONING AND PLAN SANCTIONING AUTHORITIES		12	04
	4.1	Plan sanctioning authorities-Gram Panchayat, Municipality, Municipal corporation, N.I.T		
	4.2	Purpose of Bye-laws		
	4.3	Building rules and Bye-laws of plan sanctioning authority regarding – plot area, side margins, floor space index, floor area ratio, built up area, plinth area, super built up area, minimum height of plinth, sill. Floor to floor height, maximum height of building, no. of storey's, minimum dimension of various rooms and other units such as balcony, passage, stair case		
	4.4	Procedure of plan sanctioning, Documents required.		
5.	PLANNING OF PUBLIC BUILDING		12	04
	5.1	Functional design on basis of function or purpose		
	5.2	Principles of architectural composition (Form, Units, Contrast, Rhythm, Scale.)		
	5.3	Different unit required as per function		
	5.4	Appropriate sizes of various units		
	5.5	Common units required for various public buildings such as Entrance, Sanitary units, Parking space, Telephone booth etc.		
	5.6	Data required for planning of public building such as Library, Community health center, High school, market, hospital, shopping mall etc.		

6.	PERSPECTIVE DRAWING		10	06
	6.1	Introduction- Concept of one point perspective and two point perspective		
	6.2	Terms associated- picture plane, station point, vanishing point, horizon plane and horizon line		
	6.3	Procedure for compositing one point perspective		
	6.4	Procedure for compositing two point perspective		
Total			80	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Sheet no. 1: Preparing line plans of small residential building (two/three rooms + sanitary blocks) for different plot orientation and with different scale on graph paper (A1 size)	08
2.	Sheet no. 2: Detailed drawing of small load bearing residential building with minimum two rooms, kitchen, sanitary block consisting of plan, elevation, two sections, details of foundation in 1:20 scale, site plan, area statement, schedule of openings, construction notes on A1 size sheet.	12
3.	Sheet no. 3: Data Drawing for two storied residential building framed structure type with three rooms at ground floor & sanitary block and minimum two rooms & sanitary block on first floor. The building have partly pitched slab roof. The drawing shall include ground floor plan, first floor plan, elevation, section passing through staircase, W.C. and Both room, details of foundation in 1:20 scale, schedule of openings, site plan, location plan, area statement, construction notes on A1 size sheet (scale 1:100)	12
4.	Sheet no.4 :Tracing of sheet no. 3 as above	04
5.	Sheet no. 5: Ammonia print of sheet no. 4	--
6.	Sheet no. 6: design and drawing of public building from given data. The sheet shall consist of plan, elevation, section, site plan, area statement, schedule of openings, construction notes on A1 size sheet (scale:100)	12
7.	Sheet no.7: Preparing line plan of different types of public building such as hostel, library, school, community centre, public health centre, Post office, bank etc. on graph sheet (A1 size)	08
8.	One point and two point perspective of small objects such as steps and pedestal on imperial drawing sheet (A1 size)	08

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work and Term end oral/ practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

- Lecture method**
- Improved lecture method.**
- Q & A technique.**
- Demonstration**
- Case study**

❖ **SUGGESTED LEARNING RESOURCES :**

- PRINT :** Text books/Reference books/Manuals/Journals.
- NON PRINT :** CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	06	06	-	-	06
2.	Agencies in construction work	09	06	03	-	09
3.	Planning of residential building	54	06	34	14	54
4.	Plan sanctioning	18	08	04	06	18
5.	Planning of public building	18	06	12	-	18
6.	Perspective	15	05	04	06	15
Total		120	37	57	26	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building Drawing	Shah, Kale & Patki	----
2.	Civil Engineering drawing	M. Chakraborti	----
3.	Bye- laws	NIT	----
4.	IS 2440- 1975	Guide Lines for Daylight of building.	----
5.	IS 3362- 1977	Natural Ventilation for residential building	----
6.	IS 7662 -1974- Part 4	Recommendation for orientation of building	----
7.	IS7942- 1974	Daylight of educational building 07.	----
8.	IS 8827 -1978	Basic requirement of School building.	----
9.	National building code of India Year 2005	BIS	----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	S. D. Atey	Lecturer in Civil Engineering	G. P. Nagpur
2.	N. H. Telang	Lecturer in Civil Engineering	G. P. Yavatmal
3.	R. M. Walke	Lecturer in Civil Engineering	G. P. Nagpur
4.	R. N. Giradkar	HOD, Civil Engineering	G. P. Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.**(An Autonomous Institute of Govt. of Maharashtra)****COURSE CURRICULUM****PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE 1302****COURSE TITLE : CONSTRUCTION MATERIALS****PREREQUISITE : NIL****TEACHING SCHEME: TH :02; TU :00; PR :02; TOTAL CREDITS: 04 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	--

(# - External & Internal Assessment ; @ - Internal Assessment only.)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

Civil Engineering is a discipline that deals with use of various resources on the earth for the benefit of man kind. Construction of various structures like houses, building, roads, bridges, dams, airports, docks and harbors requires the use of various construction materials available to us. A Civil Engineer, therefore, has to be knowledgeable about properties of construction materials so as to select proper and suitable material for the construction of given structure to achieve the desired quality of construction.

This subject is mainly concerned with the study of few basic construction materials. Certain Engineering materials like cement and soil have been dealt with in greater details in the course of soil Engineering and concrete Technology where as steel and Reinforced concrete will be studied in R.C.C and Steel, testing of materials is dealt under other courses. This course is therefore very basic to a Civil Engg field. Visits will help to have first hand knowledge of different materials of construction. The student should know from personnel market inquiries, the rate of materials of construction. This course is a starting point as far as construction activity is concerned. Hence study of this course is very important.

❖ OBJECTIVES :**After completing this course students will be able to–**

- Know the basic properties of various engg materials and their influence on construction operation and strength and durability of structures.
- Know the sources and method of preparation of different construction materials.
- Select the suitable type of construction material for given job.
- Know field and laboratory test to be performed for assessing the required quality standard.
- Classify the different construction materials.

❖ SKILLS :**The student will acquire the following skills:**

1. Selection of suitable type of construction material for given job.

2. Market survey of different building materials.
3. Comparison of quality of different construction materials.
4. Alternative use of materials, incase of non availability of required material.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	LIME		08	03
	1.1	Uses of lime		
	1.2	Types-fat lime, hydraulic lime		
	1.3	I.S classification		
	1.4	Field tests on lime		
2.	CEMENT		08	03
	2.1	Uses-Constituents of cement		
	2.2	Flow chart of manufacturing process of cement-wet process, dry process		
	2.3	Types of cement		
	2.4	Additives to cement: Fly- ash and slag		
3.	INTRODUCTION TO MORTAR		08	03
	3.1	Definition		
	3.2	Uses		
	3.3	Types of mortar		
	3.4	Proportion of ingredients		
4.	INTRODUCTION TO CONCRETE		08	03
	4.1	Definition		
	4.2	Uses		
	4.3	Types of concrete		
	4.4	Various ingredients		
5.	BUILDING STONES		08	03
	5.1	Types-igneous, sedimentary and metamorphic rocks		
	5.2	Characteristics of good building stones		
	5.3	Dressing of stones		
	5.4	Common varieties used in Maharashtra		
6.	BRICKS		10	05
	6.1	Types of bricks-Burnt bricks, Fly-ash bricks, hollow bricks		
	6.2	Conventional size in practice, standard I.S. size		
	6.3	Foam concrete blocks		
	6.4	Qualities of good bricks-Expected standards		
	6.5	Field and laboratory tests		
7.	TIMBER		08	03
	7.1	Use of timber in different parts of buildings		
	7.2	Chief varieties of timbers		
	7.3	Seasoning of timber- Purpose, Preservation of timber		
	7.4	Reconstructed or artificial timber-Veneers, Batten boards, Block boards, Fiber boards, laminated boards		
	7.5	Requirement of good timber		
8.	NON-CONVENTIONAL MATERIALS		09	04
	8.1	Purpose		
	8.2	Advantages and Disadvantages of materials like pre cast concrete		
	8.3	Uses of Gypsum plaster		
	8.4	Different plastic and their uses		
	8.5	Uses of P.V.C. materials		
	8.6	Fibers and their types.		

	8.7	Uses of Aluminum and mild steel in Civil Engg works.		
9.	INTRODUCTION TO FLOORING MATERIALS		08	03
	9.1	Types of flooring materials-Stones, Bricks, Cement Concrete (I.P.S.)		
	9.2	Tiles-mosaic, glazed, ceramic, marble, granite, vitrified and ceramic, paving blocks etc.		
	9.3	Common places where above flooring materials used.		
	9.4	Industrial flooring		
10.	FINISHING MATERIALS		05	02
	10.1	Paint-types and uses		
	10.2	Distemper-Types and Uses		
	10.3	Varnish-Types and Uses		
	10.4	Glass-Types and Uses		
	10.5	Aluminium composite panel		
Total			80	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
A	Collection of information and literature about following building materials from library, market and nearby industry:-	
1.	Various types of cement, their uses and rates.	3
2.	Various types of stones, aggregates their uses	3
3.	Various types of bricks their uses and rates.	3
4.	Types of timber, artificial timber, their uses and rates.	3
5.	Different roofing materials, their uses and rates.	3
6.	Different flooring materials, their uses and rates.	3
7.	Different finishing materials, their uses and rates.	3
8.	Different water proofing materials/ anti termite/ fire proofing materials and rates	3
B	1)visit to flooring tile/brick manufacturing unit	4
	2)Visit to Concrete technology Lab	4

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work.

SUGGESTED IMPLEMENTATION STRATEGIES :

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Demonstration
5. Case study
6. Seminars
7. Field visit

SUGGESTED LEARNING RESOURCES :

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total

1.	Lime	12	08	02	02	12
2.	Cement	12	08	02	02	12
3.	Introduction to mortar	12	05	04	03	12
4.	Introduction to concrete	12	06	03	03	12
5.	Building Stones	12	06	03	03	12
6.	Bricks	15	08	04	03	15
7.	Timber	12	06	03	03	12
8.	Non conventional materials	13.5	06	04	3.5	13.5
9.	Introduction to flooring materials	12	06	03	03	12
10.	Finishing materials	7.5	04	02	1.5	7.5
Total		120	63	30	27	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building Construction	Sushil kumar (Standard publication)	-----
2.	Building materials	Amarjit Agrawal (New India publication)	-----
3.	Building material	S.K.Duggal (New Age International)	-----
4.	Building Construction	B.C.Punmia (Laxmi publication)	-----
5.	Building Construction	S.C,Rangwala(Charotar publication)	-----
6.	Construction Material	D.N.Ghose (Tata Mcgraw-hill)	-----
7.	Concrete technology	M.S.Shetty	-----
8.	National Building code		-----
9.	PWD Hand books for materials, buildings	Govt. of Maharashtra	-----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	N.H.Telang	Lecturer in Civil Engineering	G.P. Nagpur
2.	S.D. Atey	Lecturer in Civil Engineering	G. P. Nagpur
3.	R.N.Giradkar	H.O.D. Civil Engg.	G. P. Nagpur
4.	P. S. Ingole	Deputy Engineer	P.W.D. Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE1303****COURSE TITLE : BASIC SURVEYING****PREREQUISITE : NIL****TEACHING SCHEME: TH :02; TU :00; PR :04; TOTAL CREDITS: 06 (Hrs./Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	25@	25@	NIL	150
MIN.	32	--	40	10	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

The knowledge and skill of surveying is a basic requirement for a Civil Engineer to initiate any Civil Engineering Project. With this knowledge and skill he will be able to choose appropriate survey methods, instruments and carry out survey work to prepare required plans/maps. The plans/maps will be further used for designing, estimating and execution of Civil Engineering Works. One should acquire knowledge and develop the skills in surveying.

❖ OBJECTIVES :**After completing this course students will be able to-**

- Use the survey instruments.
- Take linear and angular measurements.
- Measure the area of land.
- Prepare layouts and maps.
- Set out alignments for roads, railways, canals, pipelines, tunnels etc.
- Prepare contour map.
- Compute area and volume from given contour map.

❖ SKILLS : After completion of this course, students shall acquire following skills-

- 1) Identify the different instruments for Linear measurement , levelling and plane table survey
- 2) Record and observing necessary Observation with the survey instruments
- 3) Classify and discriminate various types of survey instruments.
- 4) Identify the errors of the survey instruments.
- 5) Measure distances, bearings and finding reduced levels with survey instruments.
- 6) Prepare drawing using survey data.
- 7) Prepare contour map of a given terrain/topography.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER	MARKS	HOURS
1.	INTRODUCTION:	05	02
	1.1 Types of Survey Definition, Objects of Surveying, Principles of Surveying. Uses of surveying, Classification of Surveying: Primary – Plain surveying, Geodetic surveying. Secondary – Based on Instruments, Method, Object, Nature of field.		
2.	LINEAR MEASUREMENTS:	07	03
	2.1 Instruments used for direct linear measurements in horizontal plane – Metric chain, Tape, Ranging Rod, Arrows, Pegs, Cross Staff, Optical Square, Line Ranger.		
	2.2 Ranging – Direct and Indirect Ranging, Concept of Leader and Follower, Signals used in ranging. Chaining – On Plain and sloping grounds.		
3.	CHAIN AND CROSS STAFF SURVEY	15	06
	3.1 Chain Triangulation – Survey Station and their Selections, Survey lines, Check lines, Tie lines, Base line. Well conditioned and Ill conditioned triangles. Taking offsets, Long and Short offsets, Perpendicular and Oblique offsets, Degree of precision in taking offset.		
	3.2 Conventional signs and symbols used for survey maps and plans - Wall, Wall & Gate, Road (types of Road - Foot Path, Main Road Metalled & Unmetalled), Road in Cutting, in Embankment, Railway line (single & double line), Triangulation station, Traversing station, Bench mark, Garden (flower & fruit), Sand, Tank & Pond, Cemetery, Hedge, Lines of trees, Church, Temple, Mosque, Barren land, Pipe railing, Crossings (Railway, Road over Railway, Railway over Road, Bridge carrying Railway, Electric pole, Telephone pole, Tunnel, Canal or Stream, Nallah or Natural river etc. Abbreviations used: - LB, TP, EP, PO, TO, PS, DB, RH, IB, TB etc.		
	3.3 Obstacles in Chaining: The obstacles which obstruct the Ranging but not Chaining, The obstacles which obstruct the Chaining but not ranging, The obstacles which obstruct both, Chaining & Ranging. (No numerical problems)		
	3.4 Chain & Cross Staff survey- Noting on page of field book, Precautions in booking field notes, Recording the observation. Calculation of Areas from cross staff survey, Positive areas and Negative areas, Determination of areas from plotted plans using the field notes.		
4.	CHAIN AND COMPASS TRAVERSING	18	07
	4.1 Principle of Compass Survey. Meridian – True, Magnetic, and Arbitrary. Bearing of lines – Fore bearing, Back bearing, Whole Circle Bearing, Quadrantal Bearing system or Reduced Bearing system, Conversion of bearings, finding Included angles from bearings and calculation of bearings from included angles.		

	4.2	Prismatic Compass – Component parts, construction and use, Comparison with Surveyors compass, Local attraction, Causes, Precautions and Corrections to bearings affected by Local attraction, calculation of included angles. Traversing – Open traverse, Closed traverse, Check on open and closed traverse. Graphical adjustment for closing error. Numerical problems on calculation of Bearings, Angles and Local attraction.		
	4.3	Traversing – Open traverse, Closed traverse, check on open and closed traverse, Entering the readings in field book, Plotting of traverse, Closing error, Graphical adjustment for closing error.		
	4.4	Numerical problems on calculation of Bearings, Angles and local attraction, Corrected bearings and angles.		
	LEVELLING			
5.	5.1	Definitions – Level surface, Level line, Horizontal line, Vertical line, Datum surface, Reduced level, Bench mark and its types. Dumpy level –Components, Construction, Line of sight, Line of Collimation, Axis of bubble tube, Leveling Staff – Ordinary, Telescopic and Folding type. Foresight, Back sight, Intermediate sight, Change point, Height of collimation. Fundamental axes and their relationship Recording in Level book. Temporary adjustments of dumpy level. Permanent adjustments of dumpy level (only relationships)	24	09
	5.2	Method of Reduction of levels – Height of instrument method and Rise and Fall method. Arithmetical checks, Numerical problems, Computation of missing readings.		
	5.3	Classifications of leveling - Simple, Differential, Profile, Cross sectional, fly leveling, Sources and Errors in leveling, Precautions and difficulties faced in leveling .		
	5.4	Study and use of Tilting level & Auto level.		
	COUNTOURING			
6.	6.1	Definitions – Contour, Contour Interval, Horizontal Equivalent.	04	02
	6.2	Characteristics of contours, Method of locating contours, Direct and Indirect method of contouring, Interpolation of contours, Establishing Grade contours.		
	6.3	Uses of Contour Maps. Interpretation of Typical Contour Sheets.		
	PLANE TABLE SURVEY			
7.	7.1	Principles of Plane Table Survey, Accessories required, Setting out of plane table, Leveling, Centering and Orientation, Use of Telescopic Alidade.	07	03
	7.2	Methods of Plane Table surveying – Radiation, Intersection, and Traversing.		
	7.3	Merits and Demerits of Plane Table Surveying, situations where Plane Table Survey is used.		
Total			80	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S. No.	Title of Practical/Lab. Work/Assignments	Hrs.
1.	Study and use of 20m and 30m metric chains, steel and metallic tapes, line ranger. Direct and indirect ranging. Measurement of distances on plain and slopping ground.	02
2.	Study and use of optical square and open cross staff for setting out the perpendicular offsets.	02
3.	Chain and cross staff survey for finding out areas of given field (positive and negative	02

	areas).	
4.	Study and use of prismatic compass for observing fore and back bearings and calculation of angles from observed bearings.	04
5.	Measurement and calculation of corrected bearings for 5-6 sided closed traverse, elimination of local attraction.	04
6.	Project no 1 : Chain and compass survey for simple closed traverse (5-6 sided) enclosing building, locating details and plotting them on A-1 size imperial drawing sheet (individual sheet for each student, A Whole day Project)	08
7.	Study and use of dumpy level carrying temporary adjustment and recording the reading in level book for differential leveling with arithmetic checks by Height of instrument method for R.L. calculations and by Rise and Fall method for R.L. Calculations.	04
8.	Setting the bench mark by double check method. (at least 500 m away)	04
9.	Study and use of tilting level.	02
10.	Study and use of autotest level.	02
11.	Profile levelling and cross sectioning atleast 600 m with 30 m peg interval. Length of cross section 10 m on both sides and spot level at 10 m c/c plotting on A-1 size imperial sheet.	08
12.	Block contouring –indirect contouring (200 x 200) with spot levels at (10 x 10 m) A-1 size imperial drawing sheet for plotting. Contour interval – 0.5 to 1.0 (individual sheet for each student , A Whole day Project)	08
13.	Study and use of plane table, temporary adjustment, accessories used. Orientation by magnetic needle method and back sighting method. Radiation method , Intersection method of plane table surveying for locating details.	06
14.	Plane table traversing: 5-6 sided traverse including building inside on A-1 size imperial drawing sheet. (Individual sheet for each student. A whole day project.)	08
Total		64

❖ ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work and Term end practical examination.

❖ SUGGESTED IMPLEMENTATION STRATEGIES :

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Demonstration
5. Case study
6. Seminars
7. Field visit

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Text books/Reference books/Manuals/Journals.
2. **NON PRINT** : CDs / PPT / Transparencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	7.5	3.5	04	-	7.5
2.	Linear measurements	10.5	2.5	04	04	10.5
3.	Chain & cross staff	22.5	4.5	08	10	22.5

4.	Chain & compass	27	06	09	12	27
5.	Levelling	36	08	12	16	36
6.	Contouring	06	02	02	02	06
7.	Plane table survey	10.5	02	04	4.5	10.5
Total		120	28.5	43	48.5	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Surveying and Levelling Part I and II	T .P. Kanetkar & S.V. Kulkarni PUNE VIDHYARTHI GRIHA Prakashan	----
2.	Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya, Laxmi Publication	----
3.	Surveying and Levelling	N.N.Basak Tata Mc GrawHill	----
4.	Text book of Surveying	S.K.Husain, M.S. Nagaraj S. Chand and company	----
5.	Surveying and Levelling Vol. I and II	S. K. Duggal TATA MC GRAW-HILL	----
6.	Plane Surveying	A.M.Chandra New Age International	----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	S. K. Rangari	Lecturer in Civil Engg.	G.P. Nagpur
2.	S.R. Ukey	Lecturer in Civil Engg.	G.P. Nagpur
3.	N. H. Telang	Lecturer in Civil Engg.	G.P. Yavatmal

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE1304 ^(S)****COURSE TITLE : ADVANCED SURVEYING****PREREQUISITE : CE1303 , BASIC SURVEYING****TEACHING SCHEME: TH :02; TU :00; PR :04; TOTAL CREDITS: 06 (Hrs/Week)**
(1 CREDIT = 1 CLOCK HR.)**EVALUATION SCHEME:**

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	25#	25@	NIL	150
MIN.	32	--	40	10	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only ; \$-Award of class course)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.**TIME ALLOTTED FOR PROGRESSIVETEST : 01 HR.****❖ RATIONALE :**

This Course is intended to teach students application of facts, concepts, principles, and procedures in surveying and Levelling. It is also intended to teach students Theodolite traversing and Modern Surveying instruments like Theodolite micro optic Theodolite, digital planimeter etc. With this knowledge and skill, students will be able to choose appropriate survey and levelling methods depending on requirement to carry out survey works for various civil engineering activities.

❖ OBJECTIVES :**After completing this course students will be able to-**

- Use survey instruments like Theodolite.
- Record the data in field book and plot the collected data.
- Find out horizontal and vertical distances with a tacheometer.
- Set out simple curve using Theodolite.
- Use of Modern Survey equipments - Micro Optic Theodolite, EDM and Total station.
- Apply principles of surveying and levelling for Civil Engineering works.

❖ SKILLS : After completion of this course, students shall acquire following skills-

- 1) Identify the components of plane table, theodolite and advanced survey instruments.
- 2) Know the working principles of these survey instruments.
- 3) Finding the horizontal and vertical distances, angles.
- 4) Identifying errors in setting out curve and tabulating elements of a curve.
- 5) Taking and recording the observation in the field book.
- 6) Preparing drawings, maps etc. with the observed data.
- 7) Setting out curve for the given alignment.
- 8) Use Micro optic Theodolite, EDM, Total station for finding different parameters.
- 9) Measure area of an irregular shape figure with planimeter. :

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	THEODOLITE SURVEY		38	16
	1.1	Components of Transit Theodolite and their functions. Technical terms used. Temporary adjustments of Transit Theodolite, Swinging the telescope, Transiting, Changing the face.		
	1.2	Measurement of Horizontal angle- method of Repetition, Errors eliminated by method of repetition, Method of Reiteration, Measurement of Deflection angle & Direct angle, Measurement of Vertical angle, Measurement of Magnetic Bearing of a line by Theodolite. Use of Theodolite for Prolonging a Straight line, lining-in (ranging), leveling locating point of intersection of lines.		
	1.3	Sources of Errors in Theodolite Surveying. Permanent adjustment of Transit Theodolite (only relationship of different axes of Theodolite.).		
	1.4	Traversing with Theodolite – Method of Included angles, locating details, checks in Closed traverse, Calculation of bearings from angles. Traverse Computation - Latitude, Departure, Consecutive Co-ordinates and Independent Co-ordinates, Error of closure and it's adjustment, Balancing the traverse by Bowditch & Transit rule, Gale's Traverse table; measurement of area of closed traverse from Independent coordinates and from Total departure and latitude. Simple problems on above topic.		
2.	TACHEOMETRIC SURVEY		12	04
	2.1	Definition, Principle of Tacheometry, Essential requirements of Tacheometer, Components of tacheometer.		
	2.2	Use of Theodolite as a Tacheometer with staff held in Vertical and Fixed hair method (No derivation). Equation used in Tacheometer, provisions of lenses, Determination of Tacheometric constants.		
	2.3	Simple numerical problems, finding Horizontal and Vertical distances and Reduced levels of points.		
3.	PLANIMETER		06	03
	3.1	Construction and use of Simple (Mechanical) Planimeter, simple numerical problems, anchor point inside and outside the figure.		
	3.2	Study and use of Digital Planimeter		
4.	CURVES		09	03
	4.1	Types of Horizontal and Vertical curves used in Road and Rail alignment, terms used. Commonly used Radii and Degree of curves for road and railway alignments.		
	4.2	Notation for Circular curves and corresponding calculations.		
	4.3	Setting out Curves - Methods – Offset from Long Chord method and Tangential method (Rankine's method).		
	4.4	Simple numerical problems on above topic.		
5.	ADVANCED SURVEY EQUIPMENTS		09	03
	5.1	Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite. Features of Electronic Theodolite.		
	5.2	Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M.		
	5.3	Construction and Use of Total Station.		

	5.4	Construction and Use of Digital Level.		
	5.5	Construction and Use of G.P.S.		
	AERIAL SURVEY AND REMOTE SENSING			
	6.1	Aerial Survey Introductions, definition, Aerial photograph.		
6.	6.2	Remote Sensing – Introduction, Electro-Magnetic Energy, Remote sensing system- Passive system, Active system. Applications – Minerals, Land use / Land cover, Natural Hazards and Environmental engineering system.	06	03
	Total		80	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S. No.	Title of Practical/Lab. Work/Assignments	Hrs.
1.	Understanding the components of Theodolite and their functions, reading the Vernier and temporary adjustments of Theodolite.	06
2.	Measurement of Horizontal angle by Transit Theodolite.	04
3.	Measurement of Horizontal angle by method of Repetition.	04
4.	Measurement of Vertical angles by Theodolite.	02
5.	Measurement of Magnetic bearing of a line, Prolongation of straight line, Measurement of Deflection angle using Theodolite.	04
6.	Theodolite traversing for minimum 5-6 sided traverse including building inside for small area. Computing and plotting of drawing by using Gale's Traverse table. Use of A-1 size imperial sheet for plotting .measurement of area from independent coordinates of Gale's transverse table. (A whole day project.)	12
7.	Use of Tacheometer, finding the constant of Tacheometer.	04
8.	To find reduced levels and horizontal distances using Theodolite as a tacheometer.	04
9.	Study and use of simple planimeter.	02
10.	Study and use of digital planimeter. Measurement of area enclosed by contours. (drawing plotted in basic surveying)	02
11.	Study and use of One Second Micro Optic Theodolite for measurement of Horizontal and Vertical angles	04
12.	Study and use of Electronic Theodolite (Introduction)	04
13.	Study of Total Station for knowing its components. Use of Total Station for finding Horizontal and Vertical distances and Reduced levels.	04
14.	Study and use of GPS. (Introduction)	04
15.	Setting out Simple circular curve by Rankine's method of Deflection angles and Long Chord method for a given problem.	04
	Total	64

❖ ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work and Term end practical examination.

❖ SUGGESTED IMPLEMENTATION STRATEGIES :

- Lecture method**
- Improved lecture method.**
- Q & A technique.**
- Demonstration**
- Case study**
- Seminars**
- Field visit**

❖ SUGGESTED LEARNING RESOURCES :

- PRINT :** Text books/Reference books/Manuals/Journals.

2. **NON PRINT : CDs / PPT / Transperencies / Charts / Models****C. SPECIFICATION TABLE :**

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Theodolite survey	57	10	20	27	57
2.	Tacheometric survey	18	04	06	08	18
3.	Planimeter	09	02	02	05	09
4.	Curves	13.5	03	04	6.5	13.5
5.	Adv svy instruments	13.5	05	8.5	-	13.5
6.	Aerial svy & rem sen	09	04	05	-	09
Total		120	28	45.5	46.5	120

D. REFERENCES & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Surveying and Levelling Part I and II	T .P. Kanetkar & S.V. Kulkarni PUNE VIDHYARTHI GRIHA Prakashan	-----
2.	Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya, Laxmi Plublication	-----
3.	Surveying and Levelling	N.N.Basak Tata Mc GrawHill	-----
4.	Text book of Surveying	S.K.Husain, M.S. Nagaraj S. Chand and company	-----
5.	Surveying and Levelling Vol. I and II	S. K. Duggal TATA MC GRAW-HILL	-----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	S. K. Rangari	Lecturer in Civil Engg.	G.P. Nagpur
2.	S.R. Ukey	Lecturer in Civil Engg.	G.P. Nagpur
3.	N. H. Telang	Lecturer in Civil Engg.	G.P. Yavatmal

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE 1305 ^(S)****COURSE TITLE : BUILDING CONSTRUCTION****PREREQUISITE : NIL****TEACHING SCHEME: TH :04; TU :00; PR :02; TOTAL CREDITS: 06 (Hrs per Week)**
(1 CREDIT = 1 CLOCK HR.)**EVALUATION SCHEME:**

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	25#	150
MIN.	32	--	40	--	10	10	---

(# - External & Internal Assessment ; @ - Internal Assessment only ; \$-Award of class course)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.**TIME ALLOTTED FOR PROGRESSIVETEST : 01 HR.****❖ RATIONALE :**

A civil Engineer mainly deals with construction of various structures for different purpose. He has to see how desired quality of construction, effective supervision and proper management of work is achieved. A Civil Engineer, therefore, has to be knowledgeable about basic concepts & principles of construction activity & hence in this course, basic facts, concepts, principles & procedures pertaining to construction techniques, have been dealt with. With this knowledge of construction techniques, the technician will be able to suggest suitable basic elements for the given structures and ensure the quality.

❖ OBJECTIVES :**After completing this course, students will be able to-**

- Know the basic concepts of construction activity such as concept of bond etc.
 - Understand the principle of load transfer to the soil below.
 - Differentiate between load bearing structures and framed structures.
 - Supervise masonry construction.
 - Appreciate the use of supporting structures required to facilitate main construction work.
 - Suggest suitable basic element in a given situation.
 - Know the various procedures & methods of construction of different building elements.
 - Supervise the construction work at site.
 - Understand the effects of special aspects of construction.
- Know the classification of different elements of building.

❖ SKILLS :**Students will acquire the following skills:**

1. Inspect a site and laying out foundation plan.
2. Use of different construction process.
3. Supervise construction of different types of buildings.
4. Determine the quality of material used in building construction .
5. Construction of different components of building.

6. Construction of special aspect in building such as damp proofing, termite protection, fire proofing etc.
7. Construct earthquake resistant building.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER	MARKS	HOURS
1.	INTRODUCTION	05	04
	1.1 Importance of the subject.		
	1.2 Inspection of site & site exploration & its methods.		
	1.3 Centre line plan & setting out plan.		
	Job layout for construction of structures.		
	1.4 Concept of load bearing wall structures & framed structures.		
	1.5 Advantages of framed structures over load bearing wall structure.		
2.	FOUNDATION	12	10
	2.1 Importance of foundation – purpose, types of foundation. Foundation on sandy & clayey soil,		
	2.2 Shallow foundation – purpose.		
	2.3 Wall footing, column footing, combined footing, strap footing, raft foundation.		
	2.4 Deep foundations – purpose,		
	2.5 Piles - different types of piles, concrete piles – pre cast, cast in situ		
	2.6 Under – Reamed piles.		
	2.7 Well foundations – purpose		
	2.8 Foundation on black cotton soil- - characteristics of black cotton soil.		
	2.9 Cofferdam – Earthen & sheet pile cofferdams.		
3.	STONE MASONRY:	05	04
	3.1 Construction of stone masonry in various parts of structures.		
	3.2 Technical terms used in stone masonry as facing, backing, hearting, through stones etc.		
	3.3 Important points to be observed in the construction of stone masonry.		
	3.4 Classification of stone masonry.		
	3.5 Rubble masonry – Uncoursed rubble masonry, coursed rubble masonry.		
	3.6 Ashlar masonry – Ashlar fine, rough tooled, rock faced, chamfered faced.		
4.	BRICK MASONRY	10	08
	4.1 Definition of different terms used in brick masonry.		
	4.2 General principles to be observed in the construction of good brick work.		
	4.3 Bonds in brickwork, Different types of bonds.		
	4.4 Header bond, stretcher bond, English bond, single Flemish bonds, Double Flemish bond		
	4.5 Laying of brick work – soaking of bricks in water, line level and plumb.		
	4.6 Brick on Edge, half brick wall, Reinforced brick work.		
	4.7 Cavity wall.		
	4.8 Comparison of brick masonry and stone masonry.		
5.	DOORS & WINDOWS:	08	06
	5.1 Purpose, location, function, different parts of door.		

	5.2	Different materials used for doors & window frames- timber, metal & concrete frame, aluminium frames.		
	5.3	Sizes as per I.S.I for residential & public buildings.		
	5.4	Types of door- Panelled, flush, partially & fully glazed doors, PVC door.		
	5.5	Purpose of collapsible and rolling shutter door.		
	5.6	Sizes of windows as per I.S.I .		
	5.7	Types of windows-fully paneled, glazed, louvered, steel window, aluminum sliding window, ventilators.		
	5.8	Fixtures & fastening of doors & windows.		
6.	FLOORS		08	06
	6.1	Ground floor – purpose & requirement of floors, Plinth beam, its purpose & construction.		
	6.2	Upper floors – purpose, material of construction.		
	6.3	Mezzanine floor – use, location & requirements.		
	6.4	Floor finishes & Tiles – shahabad, kotah, marble, granite, kadappa, glaze/unglazed ceramic, vitrified, plain cement, mosaic tiles, checker tiles.		
	6.5	Fixing & polishing of different types of tiles.		
	6.6	Process for fixing different types of tiles. Process for fixing different types of finishes to walls (skirting and dado)		
7.	SILLS , LINTELS & ARCHES:		05	04
	7.1	Sills – purpose, Types- concrete, kadappa, marble, granite.		
	7.2	Lintels – purpose, bearing, thickness, Types- wooden, stone, brick, R.C.C.		
	7.3	Arch – Technical term used, types,		
8.	ROOFS		05	04
	8.1	Necessity of pitched & flat roofs.		
	8.2	Steel trusses		
	8.3	Roof coverings – A.C. sheets, C.G.I. sheets. R.C.C. slab roof, pre cast slab		
9.	STAIRS		05	04
	9.1	Location, function, Technical terms, Rules for design, ,		
	9.2	I.S.I. standard dimensions for tread, rise & width for residential & public buildings,		
	9.3	Requirement of good stairs		
	9.4	Types – dog legged, quarter turn, half turn, bifurcated, open well, spiral, circular, geometric		
	9.5	Materials of construction – R.C.C., precast, metal.		
10.	FINISHING WORKS		06	05
	10.1	Plastering – purpose, mortar & its proportion, ,		
	10.2	External finishes such as sand faced , rough cast, pebble dash		
	10.3	Internal finishes such as undercoat, neeru finish and POP.		
	10.4	Pointing – purpose, types of pointing		
	10.5	Painting- purpose, process involved such as surface preparation. Applying coating, types.		
11.	SCAFFOLDING, SHORING , UNDERPINNING & FORM WORK		06	05
	11.1	Scaffolding – components & types, process of erection.		
	11.2	Shoring – purpose, types,		
	11.3	Underpinning – purpose.		
	11.4	Form work- purpose, types, form work for concrete works.		
12.	EARTHQUAKE PROTECTION		05	04
	12.1	General principles of earthquake resistant construction of		

		building.		
	12.2	Types of construction – framed construction, Box type construction.		
	12.3	Special construction features, IS codes of Earthquake Engineering.		
	Total		80	64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S. No.	Title of Practical/Lab. Work/Assignments	Hrs.
1.	Carrying a layout of small residential structure (load bearing wall type.)	04
2.	Carrying a layout of small residential structure (framed structure)	04
3.	Marking & transferring levels for flooring using a transparent plastic tube & water.	02
4.	Laying the bricks in English & Flemish bond in alternate courses for one brick thick wall corner & one and half brick thick wall corner.	04
5.	Checking thickness & verticality of plaster work using plumb bob & straight edge.	02
6.	(Report on visits to work site is to be written) Observing procedure and methods of plastering.	04
7.	Observing procedure and methods of flooring of any one type.	04
8.	LABELLED SKETCHES ON A4 SIZE SHEETS 1. Section of column footing. 2. Plan, elevation and section of flush door 3. Plan and section of R.C. C. dog-legged stair. 4. Sectional elevation of R.C.C. beams, columns & slab showing reinforcement details.	02 02 02 02

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work and Term end practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Case study

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transparencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.		Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	07	05	00	02	07
2.	Foundation	18	10	03	05	18
3.	Stone masonry	08	04	02	02	08
4.	Brick masonry	15	10	02	03	15
5.	Doors & Windows	12	10	00	02	12
6.	Floors	12	06	03	03	12

7.	Sills, Lintels and Arches	07	04	00	03	07
8.	Roofs	08	04	00	04	08
9.	Stairs	08	04	04	00	08
10.	Finishing works	09	04	02	03	09
11.	Scaffolding, Shoring, Underpinning & Formwork	09	05	02	02	09
12.	Earthquake Protection	07	03	02	02	07
Total		120	69	20	31	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building construction	Sushil Kumar, Standard Publication	-----
2.	A textbook of building construction	S. P. Arora and S. P. Bindra Dhanpat Publication	-----
3.	Building construction	B. C. Punmia -Laxmi Publication	-----
4.	Building construction	S. K. Sharma -Tata Megraw Hill	-----
5.	Building construction	S. C. Rangwala -Charotar Publication	-----
6.	Building construction	Dr. Janardanzha -Khanna Publication	-----
7.	Civil Engineering Drawing	Chakraborti	-----
8.	IS code of Building construction and NBC		
	IS codes of Earthquake Engineering		
	a) IS 4326: 1993 – code of practice for earthquake resistant design and construction of building.		
	b) IS 1893:1984 – Criteria for earthquake resistant design of structures.		
	c) IS 13920: 1993 – Ductile detailing of reinforced concrete structures subjected to seismic forces – code of practice.		
	d) IS 13935 : 1993 – Guidelines for repair and seismic strengthening of buildings.		
	e) IS 13828 : 1993 – Improving earthquake resistance of low strength masonry buildings – Guidelines.		
	f) Handbook SP 22 (S & T) : 1982 – Explanatory handbook on codes fro earthquake engineering. (IS 1893 : 1975 and IS 4326 : 1976)		
	g) IS 3067 – 1988 – Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings.		

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Prof. N. H. Telang	Lect. in Civil Engg.	Govt. Polytechnic, Yavatmal
2.	Prof. R. M. Walke	Lect. in Civil Engg.	Govt. Polytechnic, Nagpur
3.	Prof. R. N. Giradkar	HOD, Civil Engg. Deptt.	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE1306****COURSE TITLE : APPLICATION OF CAD****PREREQUISITE : IT1101, IT APPLICATION****TEACHING SCHEME: TH :01; TU :00; PR :02; TOTAL CREDITS: 03 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	--	--	--	00	50@	--	50
MIN.	--	--	--	00	20	---	--

(# - External & Internal Assessment ; @ - Internal Assessment only ;)

TIME ALLOTTED FOR TERM EXAM : Nil**TIME ALLOTTED FOR PROGRESSIVETEST : Nil**❖ **RATIONALE :**

Drawing is a language of engineers and in the era of computers. It has become the practice to plot the drawing with the help of computer. This not only saves time but also provides scope for improvements, changes in the drawings before actually plotted on the sheets. From the aesthetic point of view also the drawings give a better presentation.

Hence, it becomes mandatory for the students of diploma in civil engineering to have skills of drawing of civil engineering structures with the help of computers. This course intends to develop these skills.

❖ **OBJECTIVES :****After completing this course students will be able to-**

- Make the drawings of civil engineering structures with the help of computers
- Make the planning of buildings with optimum use of spaces.

❖ **SKILLS : The student will acquire the following skills**

1. Drawing various plans, elevations sections & other details.
2. Editing the various drawing

A. THEORY :

SR. NO.	CHAPTER		MARKS	HOURS
1.	FUNDAMENTALS OF CAD		-----	02
	1.1	Cad fundamental		
	1.2	Coordinate system in CAD		
	1.3	Absolute		
	1.4	Relative		
	1.5	Polar		
	1.6	Spherical		
	1.7	Cylindrical coordinate system,		
	1.8	Filters		
	1.9	Use of function key in AUTOCAD		

2.	BASIC COMMANDS IN AUTOCAD		-----	03
	2.1	Point, Redraw, Erase, Line, Arc, Polygon, Bllipse, Donut, Polytline, Offset text, various objects, Snap modes, Centre, End pt. insert, intersection, Midpoint, Nearest, Node, Prependicular, Quadrant, Quick, Tangent, Screen		
3.	EDIT AND DISPLAY CONTROL COMMANDS		-----	03
	3.1	Commands : Erase, Move, Copy, Rotate, Array, Mirror, Trim, Extend, Break, Fillet, Chamfer, Explode, Scale, , , limits, Zoom, Pan View, Redraw, Regen, Pedit, Hatch,gradient		
	3.2	Inquirey commands : Dist, Area, Status Help.		
4.	PLOTTING AND PRINTING		-----	02
	4.1	Detailed procedure including configuration and sub options in plotting and printing of drawing (Prplot, Plot)		
5.	SEETING COMMANDS		-----	04
	5.1	Fill, Units, Viewports.		
	5.2	Aperture, Snap isoplane, Axis, Grid, Ortho		
	5.3	Layer, Color line type, Lt Scale.		
	5.4	Attributes: Aperture, Snap, Isoplane Axis Grid ortho.		
	5.5	Attribute commands: Attdef, Atteedit.		
6.	DIMENSIONING, SURFACE GENERATING COMMANDS AND UCS :		-----	02
	6.1	Types: Liner, Angular, Radius, Diameter.		
	6.2	Surface Generating commands: Edgesurf, Revsurf, Rulesurf, Tabsurf		
	6.3	Introduction to 3D		
Total			---	16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S. No.	Title of Practical/Lab. Work/Assignments	Hrs.
1.	Drawing a line plan of two/three room buildings.	08
2.	Drawing of simple sketches such as foundation plan, plans of straight, dog legged, open Newel stair.	08
3.	Drawing of symbols of construction materials /components such as stone, brick, glass, partition wall, doors and windows.	08
4.	Drawing a line plan, Developed plan and elevation of residential building in sheet no. 2 in Building Drawing practicles .	08
Total		32



ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work .

❖ SUGGESTED IMPLEMENTATION STRATEGIES

1. Lecture method
2. Improved lecture method
3. Q & A technique

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** :.Text books/reference book/journals
2. **NON PRINT** : PPT/Transperencies

C. SPECIFICATION TABLE : NOT APPLICABLE

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
N.A.						

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	AUTOCAD Reference Manual	Autodesk Incorporation	-----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Prof. Vivek B. Dhait	Lecturer in Civil Engg.	G.P.Nagpur
2.	Prof. Swati A. Karekar	Visiting Lecturer in Civil Engg.	G.P.Nagpur
3.	Prof. Pallavi Dhawad	Visiting Lecturer in Civil Engg.	G.P.Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : CE 1307 ^(S)****COURSE TITLE : HYDRAULICS****PREREQUISITE : NIL****TEACHING SCHEME : TH :04; TU :00; PR :02; TOTAL CREDITS: 06 (Hrs/Week)**
(1 CREDIT = 1 CLOCK HR.)**EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL		25#	125
MIN.	32	--	40	---		---	--

(# - External & Internal Assessment ; @ - Internal Assessment only; \$- Award of class course)

TIME ALLOTTED FOR TERM EXAM : 03 Hrs.**TIME ALLOTTED FOR PROGRESSIVE TEST : 01 Hrs.**

- ❖ **RATIONALE:** The subject is intended to teach the student facts, Concepts, principles and procedures of Hydraulics which will enable him to apply the principles of hydraulics for planning, designing, supervising, executing and maintaining the work related to irrigation system, Environmental engineering system and Transportation engineering system. This subject serves as the base for understanding the principles and procedures of technology subjects like Environmental engineering system, Irrigation system, Transportation Engineering system and Building construction system.

❖ **OBJECTIVES :****After completing this course students will be able to–**

- Understand and analyse the problems and suggest solutions, remedial and preventive measures in hydraulics systems.
- Observe and detect any flaws in various hydraulic related works and state the changes required with justification.
- Operate various pressure, discharge, velocity measuring devices.
- Select the pumps required for particular conditions.
- Design channel section for given conditions of discharge, slope.
- Select suitable pipes for given conditions of pressure, discharge and velocity.
- Suggest alternate solutions for replacement of existing system.

❖ **SKILLS :****The student will acquire the following skills:**

1. State the basic principles and concepts of hydraulics.
2. Use the principles and concepts to determine pressures.
3. Analyse the hydrostatic pressure in case of tanks, gates, valves etc.
4. Make measurement of pressure, velocities and discharges in case of pipe flows and open channels flow.
5. Design economical sections of canals and pipe diameters for given discharges.
6. Select suitable type of pump of required power for the given conditions.

CONTENTS :
A. THEORY :

SR. NO.	CHAPTER	MARKS	HOURS
1.	INTRODUCTION	02	02
1.1	Importance of learning hydraulics with special reference to Irrigation engineering and Environmental engineering and other courses		
1.2	Definition of fluid. Definition of fluid mechanics and hydraulics.		
2.	PHYSICAL PROPERTIES OF FLUIDS	04	04
2.1	Definition and S.I. units – specific weight, mass density, specific gravity, viscosity, surface tension, Capillary rise and depression , bulk modulus of elasticity, compressibility. Numerical on specific weight, mass density, specific Gravity, bulk modulus of elasticity		
3.	PRESSURE AND ITS MEASUREMENTS	08	06
3.1	Definitions – pressure, free liquid surface, pressure head. Pressure at a point in static liquid.		
3.2	Pascal's law, Variation of pressure in horizontal and vertical direction.		
3.3	Atmospheric pressure, Gauge pressure, Absolute pressure relation between them Numericals on calculation of gauge pressures/absolute pressures.		
3.4	Measurement of pressure Manometers – Simple manometers, piezometers, U-tube Manometers, Differential Manometers, inverted U-tube Manometers, Mechanical Gauges – Bourdon's tube pressure gauge Numerical on manometer		
4.	TOTAL HYDROSTATIC PRESSURE	08	06
4.1	Definition of total pressure and centre of pressure. Expression for total pressure and depth of centre of pressure on surface immersed in static liquid, Numericals		
4.2	Pressure diagram – Definition and its use. Total pressure on vertical & inclined faces of gravity dam.		
5.	FUNDAMENTALS OF FLUID FLOW	12	10
5.1	Types of flow – steady and unsteady, uniform and non-uniform, Laminar and turbulent, compressible and incompressible, various combination of flow through pipe and channel with examples.		
5.2	Discharge-definition and its unit. Continuity equations for liquids. Numerical		
5.3	Datum head, pressure head, velocity head, total head, Bernoulli's theorem, loss of head, modified Bernoulli's theorem, Numericals on Bernoulli's theorem.		
6.	FLOW THROUGH ORIFICE	06	04
6.1	Orifice, jet of flow, vena contracta, use of orifice. Classification of Orifice according to size, shape and discharge condition.		

	6.2	Coefficient of contraction, coefficient of velocity, coefficient of discharge. Derivation of relation between them. Determination of C_c , C_v , C_d of sharp edge small circular orifice discharging free Numerical		
7	FLOW THROUGH PIPES		14	12
	7.1	Loss of head due to friction, Law of fluid friction for laminar flow and turbulent flow. Darcy-Weisbach equation. Common range of friction factor for different types of pipe material. numerical		
	7.2	Reynolds number and its significance, Relative roughness. Determination of coefficient from Moody's diagram		
	7.3	Minor head losses in pipe – loss of head due to sudden expansion, gradual expansion, sudden contraction, gradual contraction loss of head at entrance, exit and loss of head in various pipe fittings such as bends, valves, elbows etc		
	7.4	Hydraulic gradient line and total energy line. Problems on flow through pipes and drawing the HGL & EGL. simple numerical		
	7.5	Flow through pipes in series and parallel, compound pipe, equivalent pipe. Numerical		
	7.6	Water hammer – Causes, effects and remedial measures, surge tank.		
8	FLOW THROUGH OPEN CHANNELS		10	10
	8.1	Different shapes of artificial channels, wetted perimeter, wetted area, hydraulic mean depth. comparison flow through pipe and open channel.		
	8.2	Chezy's formula and Manning's formula for calculation of discharge through an open channel. Common values of Chezy's constant and Manning's constants for different types of channel surfaces. Numericals on discharge through rectangular and trapezoidal channel		
	8.3	Most economical channel section, Expressions for most economical rectangular and trapezoidal channel sections Numericals on discharge through rectangular and trapezoidal channel		
	8.4	Hydraulic jump, locations where hydraulic jump occurs, uses of hydraulic jump		
9.	FLOW MEASUREMENT		10	07
	9.1	Discharge measuring devices in closed conduits. Venturi meter – Principle, component parts, expression for discharge through venturi meter, coefficient of meter. Numericals		
	9.2	Discharge measuring devices used in open channels. Notches – types of notches, expression for discharge through rectangular and triangular notch, Francis formula, effect of end contraction and velocity of approach on discharge computation, Cippoletti weir, . Weir - Broad crested weir. Expression for discharge. Flumes – venturi flumes, standing wave flume, expression for discharge. Situations where the above devices are used. Numericals		

	9.3	Velocity measuring devices Floats – Surface floats Simple Pitot tube –expression for velocity.		
10.	SIMPLE HYDRAULIC MACHINE		06	03
	10.1	Definition of pump Centrifugal pumps – principle of working, component parts, priming of pump, and calculation of power required for pumps. Monobloc- submersible pump. Numericals		
	10.2	Definition of turbine and use of turbine.		
Total			80	64

LIST OF PRACTICALS/LABORATORY EXPERIMENTS:

- B. (Term work shall consist of following lab work/assignments/visit report. Oral is based on TW)**

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Measurement of pressure by Piezometers and pressure gauges. Measurement of difference of pressure by U-tube differential Manometer.	04
2.	Determination of hydraulic coefficient of a sharp edged circular orifice	02
3.	Determination of friction factors of a given pipe	02
4.	Determination of friction factors of a given pipe	02
5.	Reynolds experiment to study the different types of flow.	02
6.	Determination of minor losses in pipeline for (any one) 1. Sudden contraction. 2. Sudden expansion	04
7.	Demonstration of hydraulic jump.	02
8.	To find discharge through pipe using Venturimeter	04
9.	Determination of coefficient of discharge for a given rectangular/triangular notch	04
10.	Demonstration of use of current meter with the help of model current meter.	02
11.	Study of parts of centrifugal pumps . collect pamphlet of any make centrifugal/submersible pump	04
Total		32

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work and Term end oral examination.

- Lecture method**
- Improved lecture method.**
- Q & A technique.**
- Demonstration**
- Case study**

- PRINT :** Text books/Reference books/Manuals/Journals.
- NON PRINT :** CDs / PPT / Transparencies / Charts / Models.

C. SPECIFICATION TABLE

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total

1.	Introduction	3	3	--	-	3
2.	Physical Properties of Fluids	6	4	2	--	6
3.	Pressure And Its Measurements	12	4	4	4	12
4.	Total Hydrostatic Pressure	12	4	2	6	12
5.	Fundamentals of Fluid Flow	18	4	4	10	18
6.	Flow Through Orifice	9	2	2	5	9
7.	Flow Through Pipes	21	6	6	9	21
8.	Flow Through Open Channels	15	4	4	7	15
9.	Flow Measurement	15	4	4	7	15
10.	Simple Hydraulic Machine	9	2	4	3	9
		120	37	32	51	120

D. REFERENCE & TEXT BOOKS

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Hydraulics, Fluid Mechanics and Machinery -	Modi & Seth, Standard Book House	-----
2.	Fluid Mechanics -	Jagdish Lal.	-----
3.	Fluid Mechanics -	Bansal.	-----
4.	Hydraulics, Fluid Mechanics -	Levitt	-----
5.	Fluid Mechanics & Hydraulic Mechanics -	Arora.	
6.	Fluid Mechanics & Hydraulic Mechanics -	R.K. Rajput, S . Chand Publisher	81-2191666-6
7.	Hydraulics, Fluid Mechanics & Fluid Machines -	S. Ramamrutham	-----
8.	Lab Manuals Data books by PWD, MES, BIS.		-----

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	H. O. D. Civil Engg. Dept.	Govt. Polytechnic, Nagpur
2.	Mr. A. W. Pawde	Lect. in Civil	Govt. Polytechnic, Nagpur
3.			

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/EE/MT/PK****LEVEL NAME : BASIC TECHNOLOGY COURSE****COURSE CODE : CM 1308****COURSE TITLE : C-PROGRAMMING****PREREQUISITE : NIL****TEACHING SCHEME: TH : 02 ; TU : 00 ; PR : 04 ; TOTAL CREDITS: 06 (Hrs/Week)**
(1 CREDIT = 1 CLOCK HR.)**EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	--	--	--	50@	50@	--	100
MIN.	--	--	--	20	20	--	---

(# - External & Internal Assessment ; @ - Internal Assessment only)

TIME ALLOTTED FOR TERM EXAM : NA**TIME ALLOTTED FOR PROGRESSIVE TEST : NA****❖ RATIONALE :**

Computer is a fast changing field both in software as well as hardware. Day by day more advanced software packages are being developed for Programming concepts. C being most commonly used structured programming language having powerful features compared with other existing procedural language, which will certainly help development of logical thinking abilities of the programmer, which will help him to learn any advanced object oriented of 4 GL Languages.

❖ OBJECTIVES :**After completing this course students will –**

- Understand the features of 'C'
- Develop the logical abilities in students.
- Develop simple applications.
- Develop modular programs.
- Write user defined functions as per requirement
- Make user defined function as if like a library function.

❖ SKILLS :

1. Understand the features of 'C'
2. Develop the logical abilities in students.
3. Develop modular programs.
4. Write user defined functions as per requirement

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	FUNDAMENTALS OF PROGRAMMING LANGUAGE		---	04
	1.1	What is a program ?		

	1.2	History of C		
	1.3	Structure of C Program		
	1.4	Algorithm		
	1.5	Flowchart		
	1.6	Code into a high-level language		
	1.7	Compilation		
	1.8	Corrections		
	1.9	Testing process.		
2.	CONSTANT, VARIABLE, DATA TYPE AND EXPRESSION.		---	04
	2.1	Character set		
	2.2	Constant		
	2.3	Variable		
	2.4	Data Types		
	2.5	Operation		
	2.6	Expressions		
	2.7	Precedence and Associativity		
	2.8	Evaluation of expressions		
	2.9	Simple Programming		
3.	BASIC INPUT-OUTPUT		---	02
	3.1	Conversion specification		
	3.2	Reading Input Data		
	3.3	Writing Output Data		
	3.4	Single Character input-output		
	3.5	String input-output		
	3.6	General input		
	3.7	General output		
	3.8	scanf(), printf(), getc(), putc(), getw(), putw(), getchar(), putchar()		
	3.9	Programs based on Basic Input Output		
4.	DECISION MAKING AND BRANCHING		---	04
	4.1	IF Statement		
	4.2	IF.. ELSE		
	4.3	Nesting of IF..ELSE		
	4.4	The IF ELSE Ladder		
	4.5	The GOTO statement		
	4.6	The Switch statement		
	4.7	Programs based on Decision Making and Branching		
5.	DECISION MAKING AND LOOPING		---	03
	5.1	The WHILE Loop		
	5.2	The DO WHILE Loop		
	5.3	The FOR Loop		
	5.4	The break Statement		
	5.5	The continue Statement		
	5.6	The exit() Function		
	5.7	Programs based on Decision Making and Looping		
6.	ARRAYS AND STRINGS		---	04
	6.1	What are Arrays		
	6.2	Declaration of Array		
	6.3	Processing with Array		
	6.4	Initialization of Array		

	6.5	Linear Search		
	6.6	Binary Search		
	6.7	What are Strings		
	6.8	String Library functions		
	6.9	Programs based on Arrays and Strings		
7.	FUNCTIONS		---	04
	7.1	What is a Function		
	7.2	Why use Functions		
	7.3	Passing values between Functions		
	7.4	Scope Rule of Functions		
	7.5	Library Functions / User Defined Functions		
	7.6	Call by value and call by Reference		
	7.7	Recursion		
	7.8	Programs based on Functions		
8.	POINTERS		---	04
	8.1	Basic Concepts		
	8.2	Pointer expression, variable		
	8.3	Pointers & Array		
	8.4	Pointers & Character String		
	8.5	Pointers & Functions		
	8.6	Pointer Arithmetic		
9.	STRUCTURES & UNIONS		---	03
	9.1	Basic concepts & manipulation		
	9.2	Union		
	9.3	Difference between Structure & Union		
Total			---	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Problems involving sequence, selection and iteration for flow charting and pseudo code representations.	02
2.	Small problems mainly computational to illustrate expressions, operator precedence and basic Input –output.	02
3.	Iterative algorithms such as: god, sum of the series, finding root of a function, separating an integer into prime factors, finding root of a function, separating an integer into prime factors, finding the frequency and mode of an ascending sequence of numbers etc.	02
4.	Two programs based on If-THEN statement	02
5.	Two programs based on If-THEN- ELSE statement	04
6.	Two programs based on NESTED If statement	04
7.	Two programs based on Switch statement	04
8.	Two programs based on FOR loop	04
9.	Two programs based on WHILE loop	04
10.	Two programs based on DO-WHILE loop	04
11.	Two programs based on Arrays	04
12.	Two programs based on Multidimensional Arrays	04
13.	Two programs based on strings.	04
14.	Two programs based on searching techniques.	04
15.	Two programs based on sorting techniques.	04
16.	Two programs based on Functions	04

17.	Two programs based on Recursive Functions	04
18.	Two programs based on Functions (Call-by-Value/Call-by-reference)	04
Total		64

❖ ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work and Term End Practical examination.

❖ SUGGESTED IMPLEMENTATION STRATEGIES :

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Demonstration
5. Case study
6. Seminars

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Text books/Reference books/Manuals/Journals.
2. **NON PRINT** : CDs / PPT / Transparencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
Total		NA	NA	NA	NA	NA

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	The C Programming Language	Kernighan and Ritchie	0131103628
2.	Programming in ANSI 'C'	E. M. Balguruswami	978-0070648227
3.	Let Us C	Yashavant Kanetkar	978-1934015254
4.	Programming in C	Venugopal	0074634437
5.	C Projects	Yashavant Kanetkar	978-8170292562
6.	Exploring C	Yashavant Kanetkar	978-8176566339
7.	Understanding Pointers in C	Yashavant Kanetkar	978-8176565370
8.	Programming and Problem Solving Through 'C' Language	Macmillan publication	978-1403910332

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Prof.V.A.Khandekar	Lecturer	Govt. Polytechnic Nagpur
2.	Prof. R. L. Meshram	Lecturer	Govt. Polytechnic Nagpur
3.	Prof. D. Nemanwar	Lecturer	Govt. Polytechnic nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME BASIC TECHNOLOGY COURSES****COURSE CODE AM 1302****COURSE TITLE STRENGTH OF MATERIALS****PREREQUISITE AM 1301****TEACHING SCHEME TH :03; TU :01 PR :02; TOTAL CREDITS: 06 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.**TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.**

- RATIONALE:-**

Concepts and principles involved in the design of various structures in Civil Engineering are covered in this subject. Design and analysis of structure needs the basic understanding of mechanical properties of material and their behaviour under stress. The approach in teaching of subject should be such that it should develop thinking power in students.

- OBJECTIVE:-**

The student will be able to

1. Apply the knowledge to engineering problems.
2. Understand the concept of stress and its application.
3. Understand the concept of moment of inertia.
4. Understand the concept of buckling of column.

CONTENTS :

A.	THEORY :		
SR. NO.	CHAPTER	MARKS	HOURS
1	SIMPLE STRESSES AND STRAINS:	12	10
1.1	Introduction, Definition of stress, strain and elasticity. Types of stresses, stress-strain curve for ductile and brittle materials.		
1.2	Elastic limit, Hook's law, Modulus of Elasticity and their application to simple problems.		
1.3	Stresses in composite bar. Thermal stresses in simple and composite bar		

2	ELASTIC CONSTANT:	8	06
2.1	Define Linear and lateral strain, Poisson's ratio, volumetric strain. Bulk modulus, Shear strain, Shear stress, Modulus of rigidity.		
2.2	Relation between different moduli and their application to simple problems		
3	STRAIN ENERGY:	08	04
3.1	Introduction, Define Resilience, proof resilience, Modulus of resilience.		
3.2	Types of loading, Strain Energy stored in a body when load is applied gradually, suddenly and with impact and their applications to solving simple problems		
4	MOMENT OF INERTIA:	16	12
4.1	Concept of moment of inertia, Definition of moment of Inertia of plain area (figure), radius of gyration. Section modulus,		
4.2	Moment of Inertia and section modulus of plane figures such as square, rectangle, triangle, circle, semicircle, quarter circle.		
4.3	Perpendicular and parallel axes theorem and its application to symmetrical and unsymmetrical sections (including hollow sections).		
5	COLUMN:	16	06
5.1	Definition, classification of columns, different end conditions for columns, Buckling of axially loaded compression members, Effective length, radius of gyration, slenderness ratio.		
5.2	Euler's theory, assumptions and limitations of Euler's theory. Buckling Load. Factor of safety, safe load. Application of Euler's theory to solid and hollow, rectangular and circular sections.		
5.3	Rankine's formula and its application to solid and hollow, rectangular and circular sections.		
6	TORSION:	12	06
6.1	Concept of torsion, assumptions in theory of torsion, twisting moment, torsion equation, strength of shaft, Polar modulus, torsional rigidity, angle of twist.		
6.2	Application of torsion equation, Power transmitted by a solid and hollow circular shafts (Excluding joints in shaft).		
7	INTRODUCTION TO THIN CYLINDERS	08	04
7.1	Introduction to thin cylinders, circumferential and longitudinal stresses and strains, and their expressions, application of these expressions for solving simple problems.		
	TOTAL	80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
	(Any EIGHT)	
1	Study of UTM and Extensometer.	4
2	Study of compression testing machine.	4
3	Tension Test on M.S. Bar.	4
		4
4	Tension Test on TMT Bar.	4
5	Shear Test on Different Metals (i.e. mild steel/Aluminium/Brass/Copper etc.).	4
6	Compression test on wood along and across the grain.	4
7	Compression test on conventional bricks	4
8	Compression test on fly ash bricks.	4
9	Compression test on pavement blocks.	4
10	Cold bent test on TMT bars.	4

11	Izod/Charpy Impact test on metals (brass/mild steel/aluminium/copper etc).	4
12	Torsion Test on mild steel/Alluminium specimen.	4
C.	TUTORIALS	
SR. NO.	PRACTICE PROBLEMS BASED ON FOLLOWING TOPICS	HOURS
1	Simple stresses and strains, Elastic constant	4
2	Moment of inertia	4
3	Strain energy, Column	4
4	Torsion , Thin cylinders:	4

❖ **ASSESSMENT OF LABORATORY EXPERIMENTS:**

Continuous assessment of Term Work and Term end oral/ practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. **Lecture method**
2. **Assignments**
3. **Q & A technique.**
4. **Demonstration**

SUGGESTED LEARNING RESOURCES :

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transperencies / Charts / Models

D. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Simple Stresses And Strains	18	6	4	8	18
2.	Elastic Constants	12	4	4	4	12
3.	Strain Energy	12	2	2	8	12
4.	Moment Of Inertia	24	4	4	16	24
5.	Column	24	4	4	16	24
6.	Torsion	18	6	4	18	18
7	Thin Cylinders	12	2	2	8	12
Total		120	28	24	78	120

E. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mechanics of structure	R. S. Biyani	----
2.	Strength of Material	R. S. Khurmi. S.Chand	8121928222
3	Strength of Material	Ramamurtham. Dhanpat Rai & Sons	818743354X
4	Strength of Material (Vol I)	B. C. Punmia. Standard publishers	8170082153, 9788170082156

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
------	------	-------------	----------------------

1.	Y. K. CHANDARANA	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
2.	R. N. NIBUDEY	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	A. G. BHAIWAR	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
 (An Autonomous Institute of Govt. of Maharashtra)
COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING

LEVEL NAME : BASIC TECHNOLOGY COURSES

COURSE CODE : AM 1303

COURSE TITLE : MECHANICS OF STRUCTURES

PREREQUISITE : AM 1302

TEACHING SCHEME: TH :03; TU: 01 PR :02; TOTAL CREDITS: 06 (Hrs/Week)

(1 CREDIT = 1 CLOCK HR.)

EVALUATION SCHEME:

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	25#	150
MIN.	32	--	40	---	10	10	---

(# - External & Internal Assessment ; @ - Internal Assessment only)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.

TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.

● **RATIONALE:-**

Concepts and principles involved in design of various structures are covered in the subject. It forms a core course. Analysis of structure needs the basic understanding of mechanical properties of material and their behaviours. The approach of teaching should develop critical thinking in the students. In laboratory the experiments integrate the knowledge and desired skill in students.

● **SKILLS:-**

Following skills will be developed in students –

1. Skill of finding out load capacities of members of various materials like wooden beam, cast iron, flooring & roofing tiles etc in laboratory.
2. Skill of analysing simple plane frames.

● **OBJECTIVES:-**

The student will be able to

1. Understand the principles and behaviour of the member under the action of various forces.
2. Apply the basic principles to solve the problems.
3. Develop skills of finding out strength of various materials like wood, cast iron, flooring & roofing tiles.
4. Develop skill of analysing the frames.

CONTENTS :

A. THEORY :

SR. NO.	CHAPTER	MARKS	HOURS
1	SHEAR FORCE AND BENDING MOMENT:	18	14
1.1	Define beam. Types of Beam (cantilever, simply supported and overhanging), Types of loading (point load, UDL).		
1.2	Definition of Shear Force and Bending Moment, sign Convention, Relation between loading, Shear force and bending moment.		

1.3	Shear Force and Bending Moment Diagram, point of contraflexure, simple problems based on it.		
2	BENDING STRESSES IN BEAMS:		
2.1	Concept of pure bending, theory of simple bending, Assumptions, neutral axis, bending stresses and their nature, bending stress distribution, equation of moment of resistance.	15	08
2.2	Application of theory of bending, Analysis of beams for bending stresses, Moment of resistance in case of symmetrical and Unsymmetrical sections about horizontal axis.		
3	SHEAR STRESSES IN BEAMS:		
3.1	Shear stress equation; Meaning of term used in equation. Relation between maximum and average shear stress.	15	08
3.2	Shear stress distribution for Rectangular, Hollow rectangular, Angle Sections, Channel section, I-Section, T sections and Compound sections. Simple problems based on based on it.		
4	PRINCIPAL PLANES AND PRINCIPAL STRESSES:		
4.1	Concept of principal plane, oblique plane	16	08
4.2	Normal and tangential stresses on oblique plane, different states of stresses.		
4.3	Resultant and principal stresses (by analytical and Graphical Method)		
5	SIMPLE PLANE FRAMES:		
5.1	Introduction, Classification of frames, Assumptions in analysis of frames.	16	10
5.2	Method of joints, Method of section, Graphical method, Simply supported and Cantilever perfect frames with vertical & inclined loads.		
	TOTAL	80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1	Bending test on wooden beam.	4
2	Water absorption test on bricks (conventional and fly ash) and tiles.	4
3	Flexure test on flooring / roofing tile.	4
4	Verification of forces in the members of roof truss.	4
5	(Brinell/Rockwell) Hardness test on metals .	4
6	Two A2 size sheets containing four problems based on shear force diagram and bending moment diagram.	4
7	Two A2 size sheets containing four problems on principal planes and principal stresses	4
8	Two A2 size sheets containing two problems on analysis of simple plane frames.	4

C. TUTORIALS

SR. NO.	PRACTICE PROBLEMS BASED ON FOLLOWING TOPICS	HOURS
1	Shear force and Bending Moment	4
2	Bending stresses and Shear stresses	4
3	Principal planes and Principal stresses	4
4	Simple Plane Frames	4

❖ **ASSESSMENT OF LABORATORY EXPERIMENTS:**

Continuous assessment of Term Work and Term end oral/ practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. Lecture method
2. Assignments
3. Q & A technique.
4. Demonstration

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transperencies / Charts / Models

D. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Shear Force And Bending Moment	28	08	04	16	28
2.	Bending Stresses In Beams	24	08	04	12	24
3.	Shear Stresses In Beams	24	08	04	12	24
4.	Principal Planes And Principal Stresses	24	08	04	12	24
5.	Simple Plane Frames	20	04	04	12	20
Total		120	36	20	64	120

E. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mechanics of structure	R. S. Biyani	-----
2.	Strength of Material	R. S. Khurmi. S.Chand	8121928222
3	Strength of Material	S.Ramamurtham. Dhanpat Rai & Sons	818743354X, 9788187433545
4	Strength of Material (Vol I)	B. C. Punmia. Standard Publishers	8170082153, 9788170082156

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
2.	R. N. Nibudey	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	A. G. Bhaiswar	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : AM 1304 ^(S)****COURSE TITLE : CONCRETE TECHNOLOGY****PREREQUISITE : -- NIL --****TEACHING SCHEME: TH :02; TU: 00 ; PR :02; TOTAL CREDITS: 04 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	40	10	50	---	---	25#	75
MIN.	16	--	20	---	---	10	----

(# - External & Internal Assessment ; @ - Internal Assessment only , \$ - Award of class course)

TIME ALLOTTED FOR TERM EXAM : 02 HRS.**TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.**

- **RATIONALE:-**

Concrete is the most widely used construction material in all types of civil Engg. Structures. The civil engineering technician must know the basic properties of concrete as well as its ingredients.

- **SKILLS:-**

Following skills will be developed in students –

Skill of testing ingredients of concrete like cement, aggregates, concrete.

- **OBJECTIVES:-**

The student will be able to

1. Develop overall understanding of concreting operations.
2. Understand the properties of concrete and its ingredients.
3. Develop supervisory skills in all concreting operations.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER	MARKS	HOURS
1.	INTRODUCTION:	02	02
1.1	Introduction to concrete (refer to IS 456), Importance of concrete, Process diagram for concrete.		
1.2	Properties of concrete - properties in plastic stage, properties in Hardened stage viz. Durability and impermeability.		
2.	TESTING OF CEMENT:	04	03
2.1	Chemical composition of cement, physical properties of cement and I.S. specifications for Portland cement, various types of cement and uses, effect of properties of cement on properties of concrete.		

3.	PROPERTIES AND TESTING OF AGGREGATES:		
3.1	Manufacturing processes, properties of aggregate like size, shape, texture, strength, specific gravity, bulk density, water absorption, bulking of sand, soundness and durability, flakiness and elongation index. Determination of aggregate grading, sieve analysis, fineness modulus, effect of aggregate properties on strength of concrete.	04	04
4.	WATER CEMENT RATIO:		
4.1	Basic chemistry of cement, hydration of cement, Water Cement ratio and its effect on strength of concrete, durability and porosity, selection of Water Cement ratio, quality of water	02	02
5.	WORKABILITY:		
5.1	Concept of workability and factor affecting workability, cohesiveness of concrete, segregation, bleeding, harshness, slump test, compaction factor test, workability for different conditions.	04	02
6.	CONCRETE MIX PROPORTION:		
6.1	Objectives of Mix proportion, information required for mix proportion, grades of concrete, any two methods (IS code method, trial and error method).	04	03
7.	STORING, BATCHING AND MIXING INGREDIENTS OF CONCRETE:		
7.1	Storing of cement and effect of storing on strength, storing of aggregates, batching of cement, batching of aggregates by volume and by weight, mixing concrete ingredients, types of mixers, Introduction to batching plant.	04	03
8.	TRANSPORTATION, PLACING AND COMPACTION:		
8.1	Transportation of concrete, placing of concrete, preparing sub-grades, concreting in formwork, compaction, methods of compaction and precaution to be taken. Pumped concrete, Ready Mix Concrete.	04	03
9.	FINISHING OF CONCRETE:		
9.1	Screeding, floating and troweling operations, Introduction to power float, various pavers.	02	02
10.	CURING OF CONCRETE:		
10.1	Purpose of curing, methods of curing, duration of curing.	02	02
11.	ADMIXTURES AND SPECIAL CONCRETE:		
11.1	Admixtures, various types of admixtures, mineral and chemical admixtures. Introduction and use of fly-ash concrete, light weight concrete. High performance concrete, Self compacting concrete.	04	02
12.	TESTING OF CONCRETE:		
12.1	Importance of testing, various tests on concrete, interpretation of test results, Introduction to non-destructive testing of concrete	02	02
13.	FORMWORK FOR CONCRETE:		
13.1	Various types of formworks, precautions.	02	02
	Total	40	32

B. LIST OF PRACTICALS/ LABORATORY EXPERIMENTS:

S.No.	Title of Practical/ Lab.Work/ Assignments	Hrs.
	GROUP A: CEMENT (Minimum FOUR experiments)	
1.	Determination of fineness of cement.	2

2.	Determination of water for cement paste of normal consistency.	2
3.	Determination of initial and final setting time of cement.	2
4.	Determination of compressive strength of cement.	2
5.	Determination of soundness of cement.	2
	GROUP B: COARSE AGGREGATE (Minimum THREE experiments)	
1.	Determination of fineness modulus	2
2.	Determination of flakiness and elongation index	2
3.	Determination of abrasion value	2
4.	Determination of impact value	2
5.	Determination of crushing value	2
	GROUP C: FINE AGGREGATES (Minimum THREE experiments)	
1.	Determination of fineness modulus	2
2.	Determination of bulking of sand	2
3.	Determination of silt contents	2
4.	Determination of specific gravity and water absorption	2
5.	Determination of bulk density	2
	GROUP D: CONCRETE (Minimum THREE experiments)	
1.	Slump test on concrete	4
2.	Compaction factor test on concrete	4
3.	Compressive strength of concrete	4
4.	Non destructive test on concrete (study)	4

❖ ASSESSMENT OF LABORATORY EXPERIMENTS:

Continuous assessment of Term Work and Term end oral examination.

❖ SUGGESTED IMPLEMENTATION STRATEGIES :

1. Lecture method
2. Assignments
3. Q & A technique.
4. Demonstration
5. Visit to Industry

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Text books/ Reference books/ Manuals/ Journals/ IS Codes.
2. **NON PRINT** : CDs / Transperencies / Charts

D. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	03	02	-	00	02
2.	Testing Of Cement	06	02	-	04	06
3.	Properties And Testing Of Aggregates	06	00	-	06	06
4.	Water Cement Ratio	03	00	-	04	04
5.	Workability	06	02	-	04	06
6.	Concrete Mix Design	06	02	-	04	06
7.	Storing, Batching And Mixing Ingredients Of Concrete	06	00	-	06	06
8.	Transportation, Placing And Compaction	06	00	-	06	06
9.	Finishing Of Concrete	03	04	-	00	04
10.	Curing Of Concrete	03	02	-	00	02
11.	Admixtures And Special Concrete	06	00	-	06	06
12.	Testing Of Concrete	03	00	-	02	02
13.	Formwork For Concrete	03	00	-	04	04
	TOTAL	60	14	-	46	60

E. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Concrete Technology	M. L. Gambhir Tata McGraw-Hill	0070583749, 9780070583740
2.	Concrete Technology	M. S. Shetty S.Chand	8121900034, 9788121900034

E. REFERENCE I.S. CODES:

S.N.	I.S. Code No	Description	-----
1.	IS 650-1966	standard sand	-----
2.	IS 269-1967/1975	-----	-----
3.	IS 2386 (part-III)-1963	-----	-----
4.	IS 8112-1976	-----	-----
5.	IS 12269-1986	-----	-----
6.	IS 10262-2009	-----	-----
7.	IS 383-1970 (reaffirmed 1997)	-----	-----

F. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Shri. Pradeep Baringe	Customer Support Executive	Ambuja Cement Ltd. Nagpur
2.	Shri V. M. Galande	Civil Engineer & Contractor	Public Contractor Nagpur.
3.	Shri. S. S. Dikey	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGG.****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : AM 1305 (\$)****COURSE TITLE : THEORY OF STRUCTURE****PREREQUISITE : AM 1303****TEACHING SCHEME: TH :04; TU :01; PR: NIL TOTAL CREDITS: 05 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only , \$ - Award of class course)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.**TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE:-**

Course develops the concepts required in the analysis of various structures. Integration of the principles to field problems would help the students to understand the concepts.

❖ SKILLS:-

Following skills will be developed in students –

1. Skill of analysing the structures.

❖ OBJECTIVES:-

Students will be able to:

1. Know various elements of the structure.
2. To understand basic principles of structures.
3. Analyse the given problem.
4. Apply the basic principles in practice.
5. Develop skill of analysing the structures.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1	DIRECT AND BENDING STRESSES		15	15
	1.1	Concept of axial and eccentric load. Eccentricity about one or both Principal axes, stress distribution diagram and nature of stress		
	1.2	Condition for no tension, limits of eccentricity, Maximum & Minimum stresses, core section for square, Rectangular and circular sections		
	1.3	Short columns, walls, Pillars and Chimney subjected to lateral		

		pressure.		
	1.4	Structures retaining water and earth level up to top, conditions of stability.		
2	SLOPE AND DEFLECTION		20	15
	2.1	Concept of slope and deflection, stiffness of beams.		
	2.2	Slope and deflection of beam subjected to pure bending.		
	2.3	Relation between slope, deflection and radius of curvature, differential equation (No derivation).		
	2.4	Double integration and Macaulay's method of calculation of slope and deflection.		
	2.5	Application to simply supported, over hanging and cantilever beams subjected to concentrated and Uniformly distributed load. (Calculation involving solution of cubical expression not expected).		
	2.5	Propped cantilevers, reactions of prop, shear force & bending moment diagram for rigid prop.		
3	FIXED BEAM		15	08
	3.1	Concept, effect, advantages and disadvantages of fixity, fixed end Moments, nature of fixed end moments, principle of super position.		
	3.2	Formulae for Fixed end Moments for concentrated load and UDL on entire span (NO Couple), Application in Drawing Bending moment diagram & Shear force diagram for fixed beam subjected to concentrated load, Uniformly distributed load over entire span or part of span		
4	CONTINUOUS BEAM		12	10
	4.1	Concept of continuous beam, effect of continuity, nature of moments induced due to continuity, concept of deflected shape.		
	4.2	Clapeyron's theorem of three moments, application up to three spans only. Supports at the same level, spans may be equal or unequal, Moment of Inertia same for one span and may be different for other span, Calculation of Shear force and Bending Moment for concentrated load and Uniformly distributed load on entire span (No couple). The case of fixed ends and over hang is included in application		
5	MOMENT DISTRIBUTION METHOD		18	16
	5.1	Introduction, Sign convention, carry over factor, stiffness factors, distribution factor		
	5.2	Application of moment distribution method to various types of continuous beam subjected to concentrated load and UDL over entire span (No couple) [Rigid support at same level]		
	5.3	Application to single bay, single story symmetrical portal frames (without sway) Shear force diagram & Bending moment diagram for above application		
	TOTAL		80	64

B. TUTORIALS**(H-16)**

SR. NO.	IMPARTING PROBLEM SOLVING PRACTICE IN BATCHES OF 20 STUDENTS, BASED ON FOLLOWING TOPICS.	HOURS
1	Direct and Bending stresses	04
2	Slope and deflection	04
3	Fixed Beam	04
4	Continuous Beam and Moment Distribution	04

C. TERM WORK :

	TERM WORK SHALL CONSIST OF ASSIGNMENT PROBLEMS, 10 NOS ON EACH TOPIC
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❖ SUGGESTED IMPLEMENTATION STRATEGIES :

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Demonstration

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Text books/Reference books/Manuals/Journals.
2. **NON PRINT** : CDs / PPT / Transparencies / Charts / Models

D. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Direct and Bending stresses	22	02	04	16	22
2.	Slope and deflection	30	05	05	20	30
3.	Fixed Beam	23	03	04	16	23
4.	Continuous Beam	18	05	05	08	18
5.	Moment Distribution	27	05	05	17	27
Total		120	20	23	77	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Theory of structure	R. S. Khurmi, S.Chand	8121901197
2.	Theory of structure	R.S. Biyani	
3	Theory of structure	S. Ramamurtham, Dhanpat Rai and sons	
4	Analysis of structures vol 1 & vol 2	Vazirani and Ratwani, Khanna publishers	8174091408 8174092056

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	A. P. WAGHMARE	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
2.	A. G. BHAIWAR	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur

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GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CIVIL ENGINEERING****LEVEL NAME : BASIC TECHNOLOGY COURSES****COURSE CODE : AM1306****COURSE TITLE : SOIL MECHANICS****PREREQUISITE : NIL****TEACHING SCHEME: TH :02; TU: 00 ; PR :02; TOTAL CREDITS: 04 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	40	10	50	NIL	25@	25@	100
MIN.	16	--	20	---	10	10	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 02 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****RATIONALE :-**

Supervision of earthwork in the construction of civil engineering structures like Dams, road embankment and Building foundations is one of the important functions of a technician. The basic knowledge of properties and behavior of soil is therefore essential.

OBJECTIVES :-

The students will be able to

- Develop supervisory skills in earthwork operations.
- Know the properties and behavior of soil.
- Develop skill of testing soil.
- Apply soil investigations to use soil as construction material economically

SKILLS :-

Following skills will be developed in students –

- Testing of soil in field as well as in laboratory.
- Selecting suitable soil for particular construction
- Deciding type of foundation

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1	INTRODUCTION		02	01
	1.1	Definition of soil, Importance of soil in engineering & its necessity.		
2	PHYSICAL PROPERTIES OF SOIL		04	03
	2.1	Mass of Soil, two and three-phase system, properties like void ratio, porosity, degree of saturation, bulk density, dry density, saturated density, specific gravity, water content and Density index.		
	2.2	Relation between various properties		

	2.3	Introduction to swelling pressure in clayey soil eg. (black cotton soil).		
3	CLASSIFICATION OF SOIL		02	01
	3.1	Classification of soil based on Indian standard classification method		
4	PARTICLE SIZE ANALYSIS		04	03
	4.1	Mechanical analysis – Sieve analysis, grain size distribution curves, characteristic and interpretation, effective size, uniformity coefficient and coefficient of curvature and its significance, well-graded, poorly graded and uniformly graded soil.		
	4.2	Sedimentation analysis – Stoke's law and principle used in pipette method		
5	ATTERBERG'S LIMITS		04	04
	5.1	Different states of soil, liquid limit, plastic limit and shrinkage limit and their determination, plasticity index, liquidity index, consistency index		
	5.2	Plasticity chart and A-line diagram		
	5.3	Field identification of soil, dry strength test, dilatancy test and toughness test.		
6	PERMEABILITY		04	04
	6.1	Definition, coefficient of permeability, Darcy's law, typical values of coefficient of permeability for different soil,		
	6.2	Determination of coefficient of permeability by constant and variable head method, factors affecting permeability.		
7	SHEAR STRENGTH OF SOIL		04	03
	7.1	Constituents of shearing resistance of soil, definition of cohesion, internal friction and angle of shearing resistance.		
	7.2	Coulomb's law and failure envelop.		
	7.3	Shear strength of soil, Different type of tests; Applicability, Advantages and Disadvantages.(Direct shear test, Triaxial shear test, Unconfined compression test and Vane shear test)		
8	COMPACTION		06	05
	8.1	Concept of compaction, consolidation, compression and settlement, difference between compaction and consolidation		
	8.2	Relation between moisture content and dry density under constant compaction effort, optimum moisture content and maximum dry density.		
	8.3	Light and heavy compaction tests, factors affecting compaction. Standard Proctor Test		
	8.4	Field compaction methods, quality control tests, Field density by core cutter, sand replacement.		
9	SOIL STABILISATION		04	03
	9.1	Concept of soil stabilization, necessity of soil stabilization.		
	9.2	Different methods of soil stabilization – mechanical stabilization, cement stabilization, bitumen stabilization, fly ash and lime stabilization		
	9.3	Introduction to geotextile engineering		
10	BEARING CAPACITY		04	03
	10.1	Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, safe bearing capacity, allowable bearing capacity.		
	10.2	Typical values of bearing capacity for common soil as per		

		building codes.		
	10.3	Plate load test –procedure, set-up, limitations.		
	10.4	Standard penetration test- procedure, set-up, limitations.		
11	EXCAVATION			
	11.1	Methods of excavation in different soil types & different structures	02	02
	11.2	Deep excavation, method of side protection		
	11.3	Excavation below water table, in flowing waters, adjoining to existing structures		
		Total	40	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES:

S.No.	Title of Practical/Lab.Work	Hrs.
	GROUP : A) Any seven experiments of the following	
1	To carryout field identification test on soils.	2
2	Determination of water content of a given soil sample by oven dry method.	2
3	Determination of specific gravity of soil by Pycnometer.	2
4	To carryout grain size analysis and plot particle size distribution curve for given soil sample.	2
5	Determination of Liquid Limit, plastic limit and plasticity index of given soil sample	2
6	Determination of shrinkage limit, of given soil sample	2
7	Determination of coefficient of permeability by falling head test	2
8	Determination of field density and dry density by core cutter method	2
9	Determination of field density by dry density by sand replacement method	2
10	Determination of OMC and ODD by standard proctor test	2
	GROUP : B To observe the following video recorded test on soil/ Expert lecture	
1	Unconfined compression test	18
2	Triaxial shear test.	
3	Direct shear test	
4	CBR test	
5	Vane shear test	
6	Any other relevant topic of practical application	

❖ **ASSESSMENT OF LABORATORY EXPERIENCES:**

Continuous assessment of Term Work and Term end oral/ practical examination.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

- Lecture method**
- Improved lecture method.**
- Q & A technique.**
- Demonstration**

❖ **SUGGESTED LEARNING RESOURCES :**

- PRINT :** Text books/Reference books/Manuals/Journals.
- NON PRINT :** CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Introduction	03	03	--	--	03
2	Physical Properties Of Soil	06	02	02	02	06
3	Classification Of Soil	03	03	--	--	03
4	Particle Size Analysis	06	02	02	02	06
5	Atterberg's Limits	06	04	02	--	06
6	Permeability	06	04	02	--	06
7	Shear Strength Of Soil	06	04	02	--	06
8	Compaction	09	06	03	--	09
9	Soil Stabilisation	06	04	02	--	06
10	Bearing Capacity	06	04	02	--	06
11	Excavation	03	03	--	--	03
Total		60	39	17	04	60

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Soil Mechanics & Foundation Engineering	B. C. Punmia. Lakshmi Publications	8170087910, 9788170087915
2	Geotechnical Engineering	V.N.S. Murthy Taylor & Francis	0824708733, 9780824708733
3	Basic Soil Mechanics & Foundations	Alamsingh CBS Publishers & Distributors	8123901275, 9788123901275
4	IS 2720 (Parts relevant to curriculum)		
5	IS 1498 – 1970		
6	IS 1888-1962		

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	A.M.Shingare	Chief Consulting Engineer.	Geotech Services, Hingna, Nagpur.
2	Y.K.Chandarana	HOD, Applied Mechanics Dept	Govt. Polytechnic, Nagpur
3	R. N. Nibudey	Lecturer Applied Mechanics Dept.	Govt. Polytechnic, Nagpur

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