

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION BHOPAL



Three Year's Diploma Programme in Civil Engineering UNDER MULTIPOINT ENTRY AND CREDIT SYSTEM

DETAILED SYLLABUS

BASIC TECHNOLOGY COURSES	APPLIED TECHNOLOGY COURSES	DIVERSIFIED COURSES
C 401- Surveying-I	1. C 501-Public Health Engineering	1. C 601-Fabrication & Erection.
C 402-Surveying-II	2. C 502-Irrigation Engineering	2. C 602-Railway & Tunnel Engg.
C 403-Hydraulics	3. C 503-Highway Engineering	3. C 603-Concrete Technology
C 404-Mechanics of Structure	4. C 504-Q. S. C.-I	4. C 604-Advance Building Construction Technology
C 405-Civil Engg. Drawing	5. C 505-Q. S. C.-II	5. C 605-Maintenance Engineering
C 406-Material Technology	6. C 507-S. D. D.-I	6. C 606-Advance Environmental Engineering
C 407-Soil Mechanics	7. C 508-S. D. D.-II	7. C 607-Computer Aided Design
C 408-Construction Technology	8. C 509-Project	8. C 608 Advance Entrepreneurship & Equipment
C 409-W. O. M.		* Same as Advanced Entrepreneurship & Project of CTM 511.

SPONSORED BY

DIRECTOR OF TECHNICAL EDUCATION, BHOPAL (M.P.)

DEVELOPED BY

M. P. BOARD OF TECHNICAL EDUCATION, BHOPAL

IN COLLABORATION WITH

TECHNICAL TEACHERS TRAINING INSTITUTE (W. R.) BHOPAL.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

THREE YEARS DIPLOMA PROGRAMME IN CIVIL ENGINEERING
UNDER
MULTIPOINT ENTRY AND CREDIT SYSTEM

DETAILED SYLLABUS

BASIC TECHNOLOGY COURSES FOR CIVIL ENGINEERING

1. C 401 SURVEYING-I
2. C 402 SURVEYING - II
3. C 403/CTM203 HYDRAULICS
4. C 404 MECHANICS OF STRUCTURE
5. C 405 CIVIL ENGINEERING DRAWING
6. C 406 MATERIAL TECHNOLOGY
7. C 407/CTM202 SOIL MECHANICS
8. C 408 CONSTRUCTION TECHNOLOGY
9. C 409 W.O.M.

Sponsored By
DIRECTOR OF TECHNICAL EDUCATION, BHOPAL (M.P.)

Developed By
CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL

In Collaboration with
TECHNICAL TEACHERS TRAINING INSTITUTE (W.R.) BHOPAL.

P R E F A C E

In Madhya Pradesh most of the Polytechnics offer straight joacketed Diploma programmes in Civil, Mechanical, Electrical and Electronics & Tele Communication Engg. Curriculum is the most crucial input in a technical education, hence, initiating to develop a need based curriculae for establishing relevance of Polytechnic output to the needs of industry, is the demand of the time.

At present 10+ and 12+ science stream/technical stream students in different proportions join a three year diploma programme in all Polytechnics. 10+ students are admitted to first year and 12+ students in second year of three year diploma programme. These students do not have any option in selection of courses (subjects) and have no opportunity for taking alternative courses appropriate to their capability.

The National policy on Education, therefore, rightly recognised the need for a flexible structure which would allow students to enter the system at different points depending on their entry levels, and take up combination of courses according to needs, thereby facilitating the production of man power for a spectrum of technologies and occupations enhancing the efficiency of the system.

It is, in this context, that the Directorate of Technical Education, Madhya Pradesh and M.P. Board of Technical Education explored the feasibility of restructuring polytechnic education in Madhya Pradesh under World Bank Scheme by introducing the Multi Point Entry and Credit System(MPECS). This Scheme of flexible structure has been introduced at S.V. Govt. Polytechnic, Bhopal from July, 1990.

Considering the nature of the scheme, the courses (subjects) offered in this new scheme have been clustered under the following groups.

- (1) FOUNDATION COURSES are meant for preparing adequate base of science, Maths and language and they are to be undertaken only by students who have passed 10+

(Contd..2)

- (2) HARD CORE COURSES are the courses which are to be taken both by 10+ and 12+ students.
- (3) In the SOFT CORE COURSES there is a choice for the students to select the courses of their choice.
- (4) BASIC TECHNOLOGY courses are the bridge courses between Science subjects and applied Technology courses.
- (5) APPLIED TECHNOLOGY courses are the terminal courses through which the desired knowledge and skills are developed in the students, to perform his job function in the chosen field of technology.
- (6) DIVERSIFIED courses are included to provide an opportunity for some more detailed knowledge in specific areas in the same or related discipline.

The curriculum development centre of the M.P. Board of Technical Education therefore undertook the task of preparing the syllabus/curriculum of the various courses of Diploma programme in Mechanical, Electrical and Construction Technology and Management started under Multi Point Entry and Credit System in collaboration with the CDC Centre of Technical Teachers Training Institute, Bhopal. The first workshop for preparing the syllabus of the above three disciplines was conducted at TTTI, Bhopal from 26-11-90 to 1-12-90 in which teachers from various Polytechnics and particularly from S.V. Government Polytechnic, Bhopal actively participated. The Board of Studies of the respective disciplines have approved the prepared syllabus, and the syllabus is being printed with the intention that the implementation of MPECS. should continue unabated.

Where ever required a component of safety and environment has been included in the syllabus and proper care has been taken in :-

- (a) Maintaining sequence of topics.
- (b) Allotting HRS for each topics.
- (c) Avoiding overlap of the content.
- (d) Relevance of the content.
- (e) Prerequisite of the content.

(Contd...)

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The comments and healthy criticism from faculty members are however welcome, so that this prepared syllabii can be reviewed and revised periodically.

We are highly grateful to the Director Technical Education and prof. C. A. Keshwani, Additional Director of Technical Education, Bhopal for their valuable guidance, encouragement and active co-operation in organising the above workshop.

Words of obligation are due, to prof. S.A. Balu, Principal, TTTI, Bhopal and the CDC faculty of TTTI, Bhopal. It is out of their valuable suggestions and long term experience in curriculum development that this syllabus is in the hands of the user.

We aspire to improve this in times to come.

sd/-
Secretary,
M.P. Board of Technical Education,
Bhopal.

LIST OF PARTICIPANTS.

POLYTECHNIC FACULTY.

- (1) Shri B.B.Bhargava. S.V.Government Polytechnic, Bhopal.
- (2) Shri U.K.Shrivastava. S.V.Government Polytechnic, Bhopal.
- (3) Shri T.Chatterjee. Government Polytechnic, Jabalpur.
- (4) Shri B.L.Khare. Govt. Women's Polytechnic, Sagar.
- (5) Shri B.P. Sinha. S.V.Government Polytechnic, Bhopal.
- (6) Shri S.K.Saxena. S.V.Government Polytechnic, Bhopal.
- (7) Shri R.M. Hastak. Government Polytechnic, Jabalpur.
- (8) Smt. S.Ekbote. S.V.Government Polytechnic, Bhopal.
- (9) Shri R.K.Gawande. S.V.Government Polytechnic, Bhopal.
- (10) Shri R.C.Chouksey. Shri vaishnav Polytechnic, Indore.
- (11) Shri R.R.Gangane. Government Polytechnic, Ujjain.
- (12) Shri M.G.Rawal. Government Polytechnic, Jabalpur.
- (13) Shri B.K.Saxena. S.V.Government Polytechnic, Bhopal.

T. T.I. FACULTY.

- (1) Prof. V.M.Kapse. Head of the Department C.D.C.
- (2) Dr. N.S.Kapraen.
- (3) Prof. G.N.N. Rao.
- (4) Prof. H.R.Remanna.
- (5) Dr. K.C.Sabberwal.
- (6) Prof. S.B.L. Shrivastava.
- (7) Prof. D.C.Jain.
- (8) Prof. M.K.shrivastava.

CURRICULUM DEVELOPMENT CENTRE.

- (1) Shri Ashok Ratnaparkhi. Joint Director.
- (2) Shri K.K.Jain. Deputy Director.
- (3) Shri C.P.Bhargava. Deputy Director.

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M.P. BOARD OF TECHNICAL EDUCATION, BHOPLI.
 DIPLOMA IN CIVIL ENGINEERING (MECS)
 SCHEME OF STUDIES AND EXAMINATION OCTOBER -1992. REVISED ON 15.10.92

4. CATEGORY BASIC TECHNOLOGY COURSES.

S.No.	Code No.	Course	Pre-regul. site.	Hrs. Th.	Week Pr.	Cre. dit.	Sess. TW	Progr. LW	Progr. I	Progr. II	Board Exam. paper.	Dur. Mks.	Pr. Pr.	Viva	Remarks.		
1.	C/CTM401	Surveying-I.	-	2	6	5	20	20	10	10	1	3	100	1	3	50	
2.	C/CTM402	Surveying-II. C/CTM401	-	2	6	5	20	20	10	10	1	3	100	1	3	50	
3.	C403/CTM403	Hydraulics.	-	2	2	3	20	20	10	10	1	3	100	1	3	50	
4.	C404/CTM404	Mechanics of structure.	-	4	-	4	-	-	10	10	1	3	100	-	-	-	
5.	CTM405	Civil Engg. Drawing.	202	2	6	5	20	20	10	10	1	4	100	1	-	50 Viva	
6.	C/CTM406	Material's Technology	-	2	2	3	20	20	10	10	1	3	100	1	3	50	
7.	C407/CTM202	Soil Mechanics.	-	2	2	3	20	20	10	10	1	3	100	1	3	50	
8.	O408	Construction Technology.	-	2	2	3	20	20	10	10	1	3	100	1	3	50	
9.	C409	Works Organisation & Management.	-	4	2	5	20	20	10	10	1	3	100	-	-	-	
(Previous code No. C506)																	
Total							36	160	160	90	90	9	-	900	7	-	350

NOTE:- (1) All Courses are compulsory
 (2) The courses common to Diploma in Civil Engineering (MECS) & DCEM (MECS) are given the code as C/CTM whereas the courses only for Civil Engg. (MECS) are given the code, No. C/CTM
 (1) Sessonal Marks : 320
 (2) Prog. asst. Marks : 180
 (3) Theory paper Marks : 900
 (4) Practical Marks : 350

Total : 1750

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : SURVEYING- I.

COURSE CODE NO : C- 401

PREREQUISITE : NIL.

SCHEME OF STUDIES.

S.No.	TOPICS.	THEORY	PRACTICAL	TOTAL.
1.	Introduction.	01	-	01
2.	Chain surveying.	08	24	32
3.	Chain and compass Traversing.	05	21	26
4.	Levelling.	12	30	42
5.	Plane Table survey.	06	21	27
TOTAL HOURS.		32	96	128

CREDITS- 05

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SURVEYING- I.
COURSE CODE NO : C- 401
PREREQUISITE : NIL.

C O N T E N T S.

S.No. Topic.

1. INTRODUCTION :

Definition and purpose of Surveying.
Plane and Geodetic survey. Principles of Surveying.
Various instruments, used for Linear
measurements and angular measurements.

2. CHAIN SURVEYING :

Study of (i) 21 metre (ii) 30 metre chain. Knowledge
of various types of tapes, use of metallic, steel and
invar tapes according to precision requirements, use
of accessories such as ranging rods, arrows pegs.

Direct and indirect ranging.

Chain triangulation, factors affecting the location of
Survey stations, fixing the position of survey stations,
Location of objects by perpendicular off sets and
oblique offsets and their suitability. Purpose and use
of base line check line. Tie line and chain angles.
Booking field notes and plotting the same. Errors in
chaining cumulative and compensating errors convent-
-ional signs to indicate ground features of survey
such as roads, Railways, Transmission lines, use of
cross staff and optical square. Obstacles in chain
surveying, various methods to overcome
obstructions.

3. CHAIN & COMPASS TRAVERSING.

Closed and open traverse. Description and use of prismatic compass, Bearing of a line, forebearing, back bearing, whole circle bearing, reduced bearing, ~~due~~ bearing, Local attraction and its detection, Traversing by chain and compass. Closing error, Graphical adjustment of closing error.

4. LEVELLING.

Meaning of various terms used in levelling, such as level ling, horizontal plane, horizontal line, vertical line, vertical plane, datum surface, level surface, Bench mark, reduced level, line of collimation etc. various types of level, Dumpy level, Tilting level, Fundamental lines of level and their relationship. Permanent adjustment of Dumpy level (only knowledge level). Various types of levelling staves, Methods of levelling, Simple levelling Differential levelling, fly levelling, longitudinal and cross sectioning check levelling . Methods of reducing levels and checks, Computation of missing readings.

5. PLANE TABLE SURVEY :

Principles of plane table survey. Plane table and its accessories, setting of plane table on a station, orientation and its importance, Method of plane table survey, suitability of each method, Advantages and disadvantages of plane table survey, plane table survey by radiation method and inter section method.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SURVEYING- I.
COURSE CODE NO : C- 401
PREREQUISITE : NIL.

LIST OF PRACTICALS.

- (1) Study of chain survey equipments and their uses.
- (2) To fix station points and to measure length of a line by direct ranging with the help of chain and ranging rod and to draw a perpendicular from a point on chain line.
- (3) To perform a chain survey of a straight line and plot it.
- (4) To perform a chain survey of a closed traverse fixing the angle between two chain lines by tie line and to plot them and adjusting the closing error by graphical method.
- (5) Study the parts of prismatic compass and to measure the bearings of lines joining different objects to station point.
- (6) To take the Fore bearings and B.B. of sides of a regular polygon and to calculate included angle and check them.
- (7) Given the sides of a regular pentagon and F.B. of a line, to fix the points on the field to make a regular pentagon.
- (8) To perform a chain and a compass survey of an area by open traverse. and prepare a map.
- (9) To perform chain and compass survey of a closed traverse plotting the same and adjusting the traverse by a graphical method.
- (10) To study the levelling equipments and to learn temporary adjustment of a levelling instrument (Dumpy level).

contd....

- (11) To find the R.L. of the given points from a single setting of the instrument.
- (12) To find the R.L. of the given points including the points above the line of sight by different setting of the instruments.
- (13) To take the longitudinal and cross section levels of an existing road.
- (14) To study the accessories of plane table survey and to plot the objects by radial method.
- (15) To perform the plane table survey of a small area by intersection method.
- (16) To conduct the plane table survey of an area using both the methods.

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PROGRAMME : DIPLOMA IN CIVIL ENGG.
COURSE : SURVEYING- I.
COURSE CODE NO : C- 401
PREREQUISITE : NIL.

REFERENCE BOOKS.

1. Surveying by Hussain.
2. Surveying and levelling vol. I. By B.C.Punamia.
3. Plane Surveying-Vol. I. By. T.P. Kanetkar.
4. Surveying Vol I. By Clarke.
5. Practical Surveying By Foote and Davis.

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SURVEYING- II.
COURSE CODE NO : C- 402
PREREQUISITE : C/CTM 401

R A T I O N A L E .

In this subject more advanced chapters in respect to the topics and contents than surveying-I, are provided. This will make the diploma student well versed in doing more accurate and detailed survey related to civil Engineering work e.g. construction of Roads, Bridges, Irrigation works etc. More emphasis is given on the field work rather than class room teaching hence more hours are provided for field work.

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : SURVEYING- II.

COURSE CODE NO : C- 402

PREREQUISITE : C/CTM 401

SCHEME OF STUDIES

S.No of topic	TOPICS.	TH. HRS.	PR. HRS.	TOTAL
1.	Revision.	6	15	21
2.	Contouring.	8	30	38
3.	Theodolite.	8	24	32
4.	Minor Instruments.	2	3	05
5.	Setting of works.	8	24	32
TOTAL		32	96	128

CREDITS - 5

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : SURVEYING- II.

COURSE CODE NO : C- 402

PREREQUISITE : C/CTM- 401

C O N T E N T S.

S.No. Topic

1. Revision : Recapitulate the use of plane table for plotting of details and use of Dumpy level for profiles and differential levelling Toposheets and their uses.
2. Contouring : Definition of contour, contour interval, horizontal equivalent, use of contouring, Reading of a contour plan, characteristics of contours, Direct and indirect methods of contouring. Use of planimeter for calculating areas. Interpolation of contours, preparing sections from contour maps, Plotting grade contours, trace inter section of the earth embankment with ground surface, error in plotting of contours. Calculation of reservoir capacity from the contour map by trapezoidal and prismatic formula
3. Theodolite : Types of theodolites, vernier, micrometer, component parts of a theodolite size of theodolite. Fundamental axes of a theodolite, Temporary adjustments, Face left and face right observations, Measurement of Horizontal angles by repetition only. Setting out given horizontal angle, Measurement of vertical angle, checking verticality of a line, Miscellaneous operations with theodolite, measuring direct angles, measuring deflection angles, prolonging a straight line, fixing intermediate points.

4. Minor Instrument : Construction and use of optical square, hand level, alidade, box sextant and ceylon ghat tracer. Use of planimeter and to calculate the area of irregular figure.

5. Setting of works : Final location survey, setting out on the ground the lines as shown on drawings and maps, setting of page for earth work as per given drawings such as formation width, top width, side slopes and gradient, Horizontal Curves, designation of curve , types of curves, Elements of simple curve, offsets from long chord, offsets from chord produced, and deflection angle method, calculations for setting out curves, setting out curves on field.

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MIDHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : SURVEYING II.

COURSE CODE NO : C- 402

PREREQUISITE : C/TM 401

LIST OF PRACTICALS.

- (1) To find out the R.L. of the different points.
- (2) To check the R.L. of the given point performing by fly levelling.
- (3) To take the L. Section and Cross section of an existing road of a length 1/2 Km. and to plot them.
- (4) To take the block levelling of undulated site and to check the contours.
- (5) To take the L. section and Cross section of line for drawing contour map.
- (6) Preparing a contour map of a small area by direct contouring method with the help of planetable and Dumpy level.
- (7) To draw contour map of a small pond and to calculate its capacity.
- (8) Study of parts of a Theodolite and their uses.
- (9) Temporary adjustment of a theodolite.
- (10) Measurement of a horizontal angle by repetition method.
- (11) Measurement of a horizontal angle by reiteration method.
- (12) Measurement of a vertical angle.

Contd.....

- (13) To find out the R.L. of some available tall approachable object. Give the R.L. of a B.M.
- (14) To find out the height of a tall chimney or tower of or lighting conductor.
- (15) Some uses of a theodolite e.g.
 - (1) Prolonging a straight line.
 - (2) To check the verticality of Electric pole, Corner of a building etc.
 - (3) To fix a points at the required angles.
- (16) Setting out a curve in field by following methods.
 - (A) Offsets from Long chord.
 - (B) Offsets from Tangent.
 - (C) Offsets from Chord produced.
- (17) Use of Minor Instruments.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SURVEYING II.
COURSE CODE NO : C- 402
PREREQUISITE G/CTM 401

REFERENCES.

1. Text Book of Surveying by S.K. Hussain.
2. -do- by T.P. Kanetkar.
3. -do- by Punamia
I & II.
4. Plane Surveying by David Clark.
5. surveying by Foote & Davis.

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HYDRAULICS.
COURSE CODE NO.: C- 403
PREREQUISITE : NIL.

R A T I O N A L E.

Constructional Engineer are often required to deal with flow of water through pipe lines and canals, therefore they must know various hydraulic phenomena with which they have to come across during their professional carrier.

Many times they may require to design pipe line for a colony, measure the discharge in canals, to work out the forces on hydraulic structures and to select proper type of pump for a given situation. In order to be able to do so they must be trained properly to perform the above jobs satisfactorily.

The topics in the curriculum in the subject Hydraulics is so included that they fulfil the needs of a construction Engineer and is aimed at equipping them with the basic knowledge of the principles involved and preparing a base for further studies.

The curriculum is divided into nine Chapters and each chapter is allotted specific numbers of lectures to cover up the chapter.

A list of experiments to be performed to cover the curriculum and a list of books is given in the end of the curriculum.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HYDRAULICS.
COURSE CODE NO : C- 403
PREREQUISITE : NIL.

SCHEME OF STUDIES.

<u>S.No.</u>	<u>TOPIC.</u>	<u>No. of Theory period</u>		<u>TOTAL.</u>
(1)	Introduction of Hydraulics.	2	--	2
(2)	Hydrostatics.	4	--	4
(3)	Pressure and its measurement.	4	2	6
(4)	Hydrokinematics.	2	--	2
(5)	Hydrodynamics.	2	2	4
(6)	Water Discharge measurement.	5	10	15
(7)	Flow through pipes.	6	6	12
(8)	Open channels.	1	2	3
(9)	Pumps.	2	6	8

TOTAL	28	28		56

CREDITS- 3

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HYDRAULICS.
COURSE CODE NO : C- 403
PREREQUISITE : NIL.

C O N T E N T S.

S.No. TOPIC.

1. INTRODUCTION : Definition of liquid, ideal liquid, real liquid, mass density, specific weight phenomenon of compressibility, Viscosity Surface Tension, Hydrostatics, Hydro Kinematics Hydrodynamics, Definition.
2. PRESSURE AND PRESSURE MEASUREMENTS. Pressure, Pressure intensity, variation of pressure with depth of liquid, pressure head unit of pressure effect of shape and size of container on pressure. Pascal's law, Types of pressure atmospheric pressure, gauge pressure, Absolute pressure. Pressure measuring instruments Piezometer, Pitot tube, Manometer, Differential manometer. Bourdon pressure gauge.
3. HYDROSTATICS : Total pressure on plane horizontal surface on vertical surface, inclined surface centre of pressure, pressure diaphragm.
4. HYDROKINEMATICS : Law of conservation of mass, equation of continuity. Steady and unsteady flow, uniform and non-uniform flow. Laminar and turbulent flow. Lines of flow. Path line Stream line.
5. HYDRODYNAMICS : various forms of energies present in liquid flow-potential energy kinematic energy, pressure energy, Total energy, Bernoulli's theorem. Limitations of Bernoulli's theorem.
6. WATER DISCHARGE MEASUREMENT: Principles of discharge measurement through pipes. Venturimeter. Equation of discharge through venturimeter, orifice meter, Description, discharge calculations, velocity measuring instruments. Pilot tube, description, method, orifice, flow through orifice Hydraulic coefficients. Jet trajectory. Small and large orifice. Expression for discharge for free flow, submerged flow. Time required for emptying tank. Notch-sharp crested, rectangular, triangular and Trapezoidal. Expression for discharge of flow through notches. Weirs, Definition, description and types of weirs.

7. FLOW THROUGH PIPES: Laws of liquid friction for laminar flow turbulent flow, Expression for head loss in pipes due to friction. Darcy's or Weishbach equation. Major losses. Expressions for loss due to sudden enlargement, sudden contraction entrance to pipe, exit from pipe, bends Minor losses Flow through long pipe. Discharge in open and discharge in another reservoir. Pipes in series or compound pipe. Pipes in parallel discharging pipes. Hydraulic grade lines. Energy grade lines in cases Venturimeter, sudden expansion, convergent pipe, pipe connection of two reservoirs, having different water levels. Compound pipes connecting two reservoirs. Pipes connected in parallel. Syphon pipes.

8. FLOW THROUGH OPEN CHANNELS:

Open channel, uniform flow. Non uniform flow. Wetted perimeter. Hydraulic mean depth. Hydraulic gradient. Chezy's formula. Mannings formula, constant "C" for open channels.

9. PUMPS : Definition understanding description of centrifugal pump. Its components, working principles priming, types, layout selection criteria and situation where used.

Reciprocating pumps, understanding (definition, description, components, working principle, situation where used. Selection of pumps. Horse Power calculation of H.P. for pumps.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HYDRAULICS.
COURSE CODE NO : C- 403
PREREQUISITE : NIL.

LIST OF EXPERIMENTS.

1. Pressure measurement at a point. To measure difference of pressure between two given points.
2. Determination of Hydraulic coefficients C_c , C_v , C_d .
3. Determine discharge through venturimeter.
4. Determine discharge through orifice meter.
5. Plotting Hydraulic gradient line and total energy line.
6. verification of bernoullis Theorem.
7. Determine time of emptying tank.
8. Determine Friction losses through pipes.
9. Determine losses in pipe due to sudden enlargement and sudden contraction.
10. Determine discharge through open channel.
11. study the working of
 - (a) Reciprocating pump.
 - (b) centrifugal pump.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HYDRAULICS.
COURSE CODE NO : C-403
PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS.

(1) Hydraulics and Hydraulic Machines	By Shri K.D. Saxena.
(2) Hydraulics and Hydraulic Machines	By Priyani.
(3) Hydraulic and Hydraulic Machines	By Dr. Jagdish Lal.
(4) Fluid Mechanics	By Dr. A.K. Jain.
(5) Fluid Mechanics	By Dr. M.L. Mathur.
(6) Engineering Fluid Mechanics.	By K.L. Kumar.
(7) Fluid Mechanics.	By Victor L Sreeter E Benjamin Wyle.
(3) Experimental Hydraulics.	By S.N. Ghosh and S.C. Talapatra.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MECHANICS OF STRUCTURES.
COURSE CODE NO : C- 404
PREREQUISITE : 201

R A T I O N A L E.

Analysis of effect of a force system on a body or structure forms an important part of the study of engineering. The course of Engineering mechanics considers the external effect due to action of forces. In this course the effect, internal to the body material due to the action of force will be studied.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MECHANICS OF STRUCTURE.
COURSE CODE NO : C- 404
PREREQUISITE : - 201

SCHEME OF STUDIES.

<u>S.No.</u>	<u>TOPICS.</u>	<u>Th.Hrs.</u>	<u>Pr. Hr.</u>	<u>Total.</u>
1.	Stress and strain.	8	-	8
2.	Bending Moment and shear force.	14	-	14
3.	Bending stress in Beams.	8	-	8
4.	Shearing stress in Beams.	6	-	6
5.	Slope and Deflection of Beams.	6	-	6
6.	Columns.	6	-	6
7.	Fixed Beams.	8	-	8
8.	Continuous Beams.	8	-	8

TOTAL PERIOD.		64	-	64

CREDITS : 4

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MECHANICS OF STRUCTURE.
COURSE CODE NO : C- 404
PREREQUISITE : 201

C O N T E N T S .

1. STRESS AND STRAIN :

Concept of stress, Elasticity, elastic body, Internal resistance, Types of Stress- Tensile, compressive and shear, strain, Hooke's law, Modulus of Elasticity, contraction/ Elongation in length, Tensile stress on mild steel, working stress and factor of safety, Lateral strain, Poisson's ratio, change in lateral dimensions and volume, Modulus of rigidity, Relation between C, E, and K. Suddenly applied loads and corresponding stress/strain, Strain energy, Resilience, Proof resilience, modulus of resilience.

2. BENDING MOMENT AND SHEAR FORCE :

Types of beam- Statically determinate/indeterminate, cantilever, overhanging, types of support, computation of support reactions for point loads and u.d.l. concept of B.M. and S.F. Necessity of sign convention in S.F. and B.M. diagrams for simply supported and cantilever beam. Visualise the deflected shape of beam under loading. Point of contraflexure and its location in the deflected shape of the beam. Relation between B.M. and S.F. and loading rate.

3. BENDING STRESS IN BEAMS :

Neutral axis and neutral layer. Compute moment of inertia I_{xx} , I_{yy} , I_{AB} etc. for rectangular, circular, triangular and I Sections. Parallel axis theorem. Stress distribution over the section indicating maximum compressive and tensile stresses. $\frac{M}{I} = \frac{f}{Y} = \frac{E}{R}$, its understanding and application. (No derivation of the formula). Moment of resistance and its relations with maximum B.M., section modulus and its importance. M.R. = f_{bc} - derivation from bending theory.

4. SHEARING STRESS IN BEAMS :

shear stress, Expression for shear stress $q = \frac{F}{Ib} A \frac{y}{y}$
and its application (No derivation). shear stress distribution over the sections (indicating maximum values) Rectangular section, I section, T section, L, section, average and maximum shear stress. for a rectangular section.

5. SLOPE AND DEFLECTION OF BEAMS :

Concept of slope and deflection and their interrelation. Necessity of evaluation of slope and deflection, strength and stiffness against slope and deflection. Maximum slope and deflection values for Udl and Point loads on following beams (i) Cantilever (ii) Simply supported beam (iii) fixed beam (iv) continuous beam.

6. COLUMNS:

End conditions, and equivalent length. Radius of gyration and slenderness ratio Classification as per mode of failure. Euler's and Rankine's formulae. Radius of gyration and slenderness ratio. Use of Euler's and Rankine's formulae in solving various problems.

7. FIXED BEAM :

Concept, Advantages & draw backs, computation of fixed end moments for a fixed beam for following loading (i) single point load- Central/eccentric (ii) Two point loads (iii) u.d.l. over entire span.

Drawing of B.M. diagrams indicating the maximum +ve and -ve values. Maximum deflection formulae for simple cases.

8. CONTINUOUS BEAM:

Concept, Advantages and draw backs, computation of BEM for a continuous beam. Clapeyron's theorem. Drawing the B.M. diagrams indicating the maximum +ve, and -ve values. Computation of support reactions.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING DRAWING.
COURSE CODE NO : C- 405
PREREQUISITE : CTM 204

R A T I O N A L E.

In any Engineering, drawing plays an important part. Since the knowledge of this subject is required while planning, designing and executing the project.

The students should be well versed in this subject and should be able to read/interpret the drawing thoroughly and also able to draw the sketching/drawing correctly.

Keeping this view in D.C.T.M. Programme, the subject Drawing is kept in two parts named as "Elements of Civil Engineering Drawing" and "Civil Engineering Drawing."

At this level in " Civil engineering Drawing" the Chapters of Drawing on more complicated Civil Engineering structure are included, e.g. Stair case, Residential building with pitched roof, double storeyed building etc.

Hope this course will fulfill the requirements of a technician in construction Technology and Management.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING DRAWING.
COURSE CODE NO : C-405
PREREQUISITE : CTM 204

SCHEME OF STUDIES.

<u>S.No.</u>	<u>TOPIC.</u>	<u>THEORY Hrs.</u>	<u>Pr.Hrs.</u>	<u>Total</u>
1.	Drawing of stair case.	6	18	24
2.	Single storyed Residential building with pitched roof.	4	16	20
3.	Double storeyed shop cum residential building on framed structures.	6	20	26
4.	Building services & their connections.	6	16	22
5.	Modification in existing building.	4	8	12
6.	Small bridges and culverts.	6	18	24

	TOTAL	32	96	128

CREDIT - 5

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING DRAWING.
COURSE CODE NO : C- 405
PREREQUISITE : CTM 204

C O N T E N T S.

TOPIC-1. DRAWING OF STAIR CASE :

Importance of stair case in building selection of proper utilised space for stair case.

Types of stair case used in building i.e. straight flight, Dog legged, Openwell stair case.

TOPIC-2. SINGLE STOREYED RESIDENTIAL BUILDING WITH PITCHED ROOF :

Types of Roofs used as lean to roof, Timber truss, king post & Queen Post, steel truss.

Various members used in pitched Roof like Tie beam, principle Rafter, Ridge, Eave Board, Common Rafter, Purlin, Battens and Roof covering materials Tiles, A.C. sheets, G.I. sheets.

TOPIC-3. DOUBLE STOREYED SHOP CUM RESIDENTIAL BUILDING ON FARMED STRUCTURE :

Types of farmed structures like circular columns square columns with footing details.

TOPIC-4. BUILDING SERVICES AND THEIR CONNECTIONS:

Position of water supply fittings, laying of pipe line with accessories like Bend, Socket, Union, Elbow, Tee, Types of taps used. Laying of sewes line, position of inspection chamber, septic tank, Sanitary fittings, Position of wash basin sink etc.

TOPIC-5. MODIFICATION IN EXISTING BUILDING :

Addition and alterations to be incorporated in existing plan.

TOPIC-6. SMALL BRIDGES AND CULVERTS :

Pipe culvert drawing showing Number of pipes, face wall, splayed wing wall, Turn wall, Parapet wall Road way. Slab type bridge : showing Abutment, Pier, wing wall Parapet wall, Roadway.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING DRAWING.
COURSE CODE NO : C- 405
PREREQUISITE : CTM 204

RECOMMENDED PLATES TO BE DRAWN BY STUDENTS.

1. Drawing of stair case ; Two plates on straight Flight and openwell. One plate for doglegged stair case.
2. Single storied Residential building with pitched Roof Joint. ; One sheet for Timber Truss including King post & Queen post. showing the One sheet for steel Truss. One sheet for lean top Roof with Roof covering materials used like Tile, Half Round Tile, G.I. sheet, A.C. sheet Trafford type.
3. Double storied shop cum Residential building on framed structures. ; Two sheets one sheet each of various combinations.
4. Building services and their connections. ; One Sheet showing layout plan of Water Supply and Sanitary layout.
5. Modification in existing building. ; One sheet.
6. small bridges and Culverts. ; Two sheets each for culvert and bridge.

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING DRAWING II.
COURSE CODE NO : C- 406
PREREQUISITE : CTM 204

RECOMMENDED BOOKS.

1. Civil Engineering Drawing by Leo & Mallic
2. -do- by Verma.
3. Building construction. by Sushil Kumar.
4. Civil Engineering Drawing by S.C.Rangwala.
5. Building Drawing. by Shah, Kale and Patki- Tata McGraw Hills.
6. A course in Civil Draughtmanship.
Hindi version by G.S. Birdi
Dhanpat Rai & Sons
Delhi.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MATERIAL TECHNOLOGY.
COURSE CODE NO : C- 406
PREREQUISITE : NIL.

R A T I O N A L E.

Construction Technology and Management Technician has to work as a supervisor in the field of Civil Engineering construction works. He should therefore be in a position to select the proper material and use the same in the construction of a structure. Hence, he should know the properties, Tests (whichever required) and skills in selection of the materials.

The selection of materials and test should be according to I.S. specifications.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : MATERIAL TECHNOLOGY.

COURSE CODE NO : C- 406

PREREQUISITE : NIL.

SCHEME OF STUDIES.

<u>S.No.</u>	<u>Topic.</u>	<u>Th.Hrs.</u>	<u>Pr. Hrs.</u>	<u>Total.</u>
1.	Introduction.	2	-	2
2.	Stones and sand.	7	10	17
3.	Bricks.	4	8	12
4.	Binding Materials			
	(a) Mortar.			
	(b) Lime.			
	(c) Cement.	10	12	22
5.	Timber.	4	6	10
6.	Paints, Varnish & Colours.	4	-	4
7.	Flooring Materials.	4	-	4
8.	Roofing materials.	3	-	3
9.	Steel and Aluminium Products.	2	4	6
10.	Plastics.	2	-	2
11.	Miscellaneous.	4	-	4
12.	Market Survey.	2	24	26

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TOTAL 48 64 112
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CREDITS - 5

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MATERIALS TECHNOLOGY.
COURSE CODE NO : C- 406
PREREQUISITE : NIL.

TOPIC-1. INTRODUCTION :

Importance of material Technology for Civil Engineer.
Ask the students to name the common Engineering materials they know.

TOPIC-2. STONE & AGGREGATE :

Classification of Rocks- Geological (Igneous, Sedimentary and Metamorphic),

Properties of good building stones.

Methods of Quarrying.

stone used as aggregate for Road construction with their various grades as per I.S.

Use of aggregate for building work at various stages.

Testing of aggregates.

Sand. Its sources and properties and important tests.

TOPIC-3. BRICKS : AND ITS PROPERTIES:

Method of preparation of bricks. Table moulded and Ground moulded Bricks.

Burning of bricks Hoffman's Continuous kiln

Properties of Good building bricks.

Testing of bricks.

TOPIC-4. BINDING MATERIALS :

For low cost construction houses murrum used as binding material

Properties of Murum for Road work.

Lime used as binding Material.

Types of lime :- Fat lime, Hydraulic Lime, Quicklime

Properties of lime.

Cement Different ingredients used for manufacturing cement with their percentage

Methods of preparation of Cement by (i) wet process
(ii) Dry process

Testing of cement.

Types of cement and their functional uses.

TOPIC-5. TIMBER : Difference between wood and timber. Timber to be used as an Engineering Material, Growth of Timber:- Exogeneous, Endogeneous, Defects in Timber- Knot, Twisted fibres, Rind gall, Sealing of Timber, Preservation of timber Plywood, veneers Laminated plywood.

TOPIC-6. PAINTS, VARNISHES & COLOURS :

Different ingredients used in manufacturing/ preparation of paints, Primers, their different types for steel and timber. Use of paint as protecting surface device for steel surface type of paint used and for wood surface types of paint used.

VARNISH : Method of preparation of Varnish, Component materials used in varnish.

COLOURS : For decorative purpose and finished purpose use of colour as water base, colour as oil base, Distemper and snowcem.

TOPIC-7. FLOORING MATERIALS :

Different types of floors used in building. Mud-floor, Flag stone floor, cement concrete floor, Mosaic flooring, Tile floors, ceramic tile floor, glazed floors, wooden floor's glass floor.

TOPIC-8. ROOFING MATERIALS.

Roof covering Materials as Bamboo Mats, Galvanized iron Sheets corrugated types, Asbestos cement sheet plain and Trafford type, Tiles, Allahabad Tiles, Manglore tiles, Half Round tiles.

TOPIC-9. STEEL AND ALUMINIUM PRODUCTS:

Steel used as Engineering Material in different shapes. like T-section, Angle Section, Channel Section, I-Section Steel sheets used in manufacturing of Doors.

Aluminium: Used as construction material :

TOPIC-10. PLASTICS:

P.V.C. Pipes used as a materials in pipe laying for water supply purposes, Irrigation etc. Water tanks.

TIPIC-11. MISCELLANEOUS : Give the concepts about the other materials which can be used as Engineering Materials like Glass, Rubber, Tar, Emulsion, Bitumen, Glass wool, Use of J bolts, U Hooks, stoneware pipes, Galvanized iron pipes.

TOPIC-12. MARKET SURVEY :

Ask the students to collect the cost of items listed above and supplement the additional items with cost left at the time of listing of item.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MATERIAL TECHNOLOGY.
COURSE CODE NO : C- 406
PREREQUISITE : NIL.

LIST OF EXPERIMENTS.

1. GRADING OF AGGREGATE (1) Fineness Modulus of fine Aggregate.
(2) Fineness modulus of Coarse Aggregate.
(3) Flakiness Index.
(4) Aggregate Crushing test(Demonstration)
(5) Impact Test.
2. TEST ON BRICKS. (1) Water Absorption Test.
(2) Compressive strength of bricks.
(3) Murrum Test.
3. TEST FOR CEMENT. (1) Fineness of cement.
(2) Normal consistency of cement.
(3) Setting time test initial and final.
(4) Tensile strength.
4. TESTING FOR STEEL (1) Tensile strength of M.S. bar.
(2) Shear strength on M.S. bar.
5. TEST FOR TIMBER (1) Study of cross section of Timber.
(2) Identify the defects in Timber from given sample of test piece.
(3) Strength of Timber across the grains and parallel to the grains.
6. MARKET SURVEY. Study of different Engineering Materials used in construction work and their price.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOJL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MATERIAL TECHNOLOGY.
COURSE CODE NO : C- 406
PREREQUISITE : NIL.

RECOMMENDED BOOKS.

- (1) Engineering Materials. By Rangwala.
- (2) Engineering Materials. By Deshpande.
- (3) Engineering Materials. By Ojha.
- (4) Engineering Materials By Surendra Singh.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SOIL MECHANICS.
COURSE CODE NO : C- 407
PREREQUISITE : NIL.

R A T I O N A L E.

Field of construction is an important area for passout from polytechnic. Day to day supervision of construction work is an important function. Therein 'Earth work' is an important item of the construction of Civil Engineering works e.g. Dams, embankments and cutting work in the construction of Roads and Railways, Pavement etc. for efficient supervision and proper execution of the earth work, the technicians must have knowledge of the basic principles of Soil Mechanics.

With the motto in mind the subject of "Soil Mechanics" has been introduced in Diploma Course.

To develop interest in the students towards this subject, a chapter of "Introduction" is included which deals with concept/history and scope of Soil Mechanics.

Supervision of construction work rather than design of structure is considered more relevant to the job function of a technician and hence more emphasis is given to the practical aspect. However, necessary theoretical background has also been incorporated.

Hope this will fulfil the requirements of a Civil Engineering Technician.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SOIL MECHANICS.
COURSE CODE NO : C- 407
PREREQUISITE :

SCHEME OF STUDIES.

S.NO.	TOPICS.	HOURS.		Total.
		Theory.	Pr.	
(1)	Introduction.	1	0	1
(2)	Soil formation and Composition.	2	0	2
(3)	Soil Classification.	4	5	9
(4)	Permeability.	3	3	6
(5)	Shear strength and Bearing Capacity.	6	8	14
(6)	Compaction.	3	4	7
(7)	Soil Stabilisation.	3	0	3
(8)	Earth Pressure.	3	0	3
(9)	Soil Investigation and sampling.	3	8	11

TOTAL:		26	28	56

CREDITS - 3

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : SOIL MECHANICS.

COURSE CODE NO : C- 407

PREREQUISITE :

C O N T E N T S.

1. INTRODUCTION TO SOIL MECHANICS :-
Concept of soil, Definition and meaning of soil mechanics, History of Soil Mechanics, Scope of soil mechanics.
2. SOIL FORMATION & COMPOSITION :
Definition of soil mass, Components of soil Mass, phase diagra. of soil mass and its labelling weight and volume of soil with usual notation, Dry soil and wet soil, void ratio, porosity and their relations, Types of water in soil, Relations between V, S, S, E and W , Bulk density, Difference between absorbed water and adsorbed water in soil. Moisture contents as saturated, dry density.
3. CLASSIFICATION OF SOIL :
Definition of coarse and fine grains, Homogeneity, consistency, cohesive ness, toughness, shear strength, compressibility, Difference between coarse and fine grained soil.
Two methods of soil classification grain size classification of soil as per I.S.I. and plasticity classification of soil.
Sieve analysis of soil and sedimentation of soil, log, scale of particle size.
Stokes law consistency limits. Liquid limit, plasticity limit, shrinkage limit and $L.L.$
 $P.L.$
plasticity index (P.I.)
consistency limit diagra. and limits. Laboratory methods to find out these.
Classification of fine grained soil by using plasticity chart. Field identification tests. I.S. classification chart.

4. PERMEABILITY : Definition and understanding of permeability. Different types of soil and permeability. Laminar and turbulent flow. Importance of permeability. Coefficient of permeability and its determination in laboratory. Darcy's Law.

Factors affecting permeability. Field determination of permeability, concept meaning of seepage, Effects of seepage, flow lines and flownet (only understanding)

5. SHEAR STRENGTH AND BEARING CAPACITY.

Concept of shear strength of loaded soil. Friction and coefficient of Friction between two soils, Internal friction, cohesion, Normal and shear stress, shear strength of soil. Factors on which shear strength of soil depends Coulomb's law, shear failure.

Types of shear test. Box shear test and triaxial test. Causes of Failure of foundation Meaning of Bearing capacity and safe Bearing capacity. Concept of S.B.C., ultimate bearing capacity. Method of finding S.B.C. (Plate load test) of soil factors affecting Bearing capacity of soil.

6. COMPACTION:

Concept and meaning of compaction.

Consolidation and its meaning. Difference between consolidation and compaction.

Max. Dry density and optimum moisture content. Proctor test. Factors affecting compaction. Methods of compaction in field.

7. Soil Stabilization:-

Concept and meaning (purpose) of soil stabilizing. Methods of stabilization, Materials of stabilizing of soil and their uses. C.B.R-application and determination.

8. EARTH PRESSURE :

Earth pressure, effective pressure. Neutral pressure, and total pressure Magnitude of earth pressure. Rankine's theory, Assumptions made in the Rankine's theory. Earth retaining structures. Earth pressure on earth retaining structures.

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9. SOIL INVESTIGATIONS :

Meaning and objectives of soil investigation. site investigations. site exploration. Number, Depth and disposition of borings. Methods of exploration. Trial pits types of Augers. Auger boring, Wash boring and percussion drilling.

Soil sample and their types disturbed and undisturbed samples and their meaning. Record of boring Borehole log.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLUR.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SOIL MECHANICS.
COURSE CODE NO : C- 407
PREREQUISITE : NIL.

LIST OF EXPERIMENTS

1. Field Density. Core Cutter/Sand Replacement.
2. Moisture contents.
3. Specific gravity by pycnometer/or Density Bottle.
4. Liquid Limit.
5. Plastic Limit.
6. Shrinkage limit.
7. Grain size Analysis.
8. Compaction Test- Light and Heavy.
9. Soil Sampling.
10. Field Identification Tests.
11. Box shear Test.
12. Triaxial shear Test.
(Demonstration only)

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : SOIL MECHANICS.
COURSE CODE NO : C- 407
PREREQUISITE : NIL.

LIST OF REFERENCES.

<u>S.No.</u>	<u>Name of Book.</u>	<u>Author.</u>	<u>Publisher.</u>
1.	A Text Book of Soil Mechanics.	Dr. S.B. Sehgal	Metropolitain Book Co.Pvt.Ltd.New Delhi.
2.	Introductory Soil Mechanics.	S.N. Awasthy.	J.K.Publishing House, Bhopal.
3.	A Text Book of Soil Mechanics.	Bharat Singh.	Nemi Chand Prakashan Roorkee.
4.	Soil Mechanics and Foundation Engg.	Ilam Singh.	Standard Book House Delhi.
5.	Soil Mechanics and Foundation Engineering.	Dr.B.C.Punamia.	Standard Book House, Delhi.
6.	Elements of Soil Mechanics.	Kamalkar.	
7.	I.S. Code 2720 (Part I, II, III, IV, V, VI, VII, IX, XI, XIII, I XXV, XXVIII, XXVI)		
8.	I.S. Codes 1892, 2132, 2809		

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MADHAI. PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING.
COURSE CODE NO : C- 408
PREREQUISITE : NIL.

R A T I O N A L E.

The main job of a civil technician is to supervise the construction work as per the design and drawing provided to him. Therefore he must be able to understand various Civil Engineering construction like foundation, Masonary work, Concreting etc. He must be able to choose correct construction procedure, equipment and method required to execute the job.

This subject of basic technology level is included so that the student develops abilities to understand various civil engineering construction activities like planning, designing, preparation of working drawings, layout, actual construction and maintenance of various civil engineering structures which are main activities of his job function.

Exposures to site conditions and actual working through site visits and extension lectures are also included for better understanding of the complicated procedures. Study of Indian Standards, National Building Code, Code of Practices will enforce the theoretical concepts, safety precautions and awareness to low cost Houses. Environmental Engg. sciences is also given a due weightage in the syllabus.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING.
COURSE CODE NO : C- 408
PREREQUISITE : NIL.

SCHEME OF STUDIES
CONSTRUCTION TECHNOLOGY

HOURS/WEEK : THEORY (2) PRACTICAL (2) CREDIT : (3)

<u>S.NO.</u>	<u>TOPIC</u>	<u>Theory</u> <u>Hours.</u>	<u>Practical</u> <u>Hours.</u>	<u>Total</u> <u>Hours.</u>
1.	Introduction.	2	-	2
2.	Foundation	5	10	15
3.	Concrete	3	4	7
4.	Masonry	3	-	3
5.	Doors & Windows.	1	-	1
6.	Stair cases	2	2	4
7.	Roofs & Trusses	4	-	4
8.	Floors	2	-	2
9.	Finishing Items.	2	-	2
10.	scaffoldings & site Clearance	2	-	2
11.	Machinery & Equipments	2	-	2
12.	Safety & Environmental aspects	2	-	2
13.	Element of Low cost Housing.	2	-	2
14.	Visits	-	16	16
TOTAL:		32	32	64

SCHEME OF EXAMINATION

<u>Sessional</u>		<u>Progressive</u>		<u>Board Examination</u>		<u>Practical/Viva & Sketches.</u>		
<u>TW</u>	<u>LW</u>	<u>I</u>	<u>II</u>	<u>Paper</u>	<u>Dura. Marks</u>	<u>Pract.</u>	<u>Dura. Marks.</u>	<u>Sketches.</u>
20	20	10	10	1	3	1	3	50

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
B.K.P.L.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING.
COURSE CODE NO : C- 408
PREREQUISITE : NIL.

COURSE CONTENTS

- | <u>Topic No.</u> | <u>Course contents</u> |
|------------------|---|
| 1. | <u>INTRODUCTION</u> :
Components of a structure sub/super structure, Types of structure, framed & load bearing structure, comparison between two, site selection. |
| 2. | <u>FOUNDATION</u> :
Importance, necessity, types, trenches/pile type, empirical formulae for design of foundations, selection of foundation, bearing capacity, construction procedure, types of piles, shoring in soft soil, lay out of building. Under-reamed piles, timber pile and precast pile, concrete pile, prestressing and post tensioning. |
| 3. | <u>CONCRETE</u> :
Types, grades as per I.S. code, workability, water cement ratio and its effect on workability and strength, testing of concrete for strength and workability, centering, false work, mixing, laying and curing of concrete. |
| 4. | <u>MASONRY</u> :
Types, stone, bricks, hollow concrete block, comparison, uses, terms involved, bonds in bricks and stone masonry, types and their merits. |
| 5. | <u>DOORS AND WINDOWS</u> :
Types, details of doors and windows, materials, their suitability, sizes as per I.S. code. Selection of proper type. |
| 6. | <u>STAIRS</u> :
Various terms used, types, suitability, material used in construction of stairs. Relation between rise and tread, empirical formula and I.S. code for these, I.S. standard, design of stair case for the given situation. |
| 7. | <u>ROOF & TRUSSES</u> :
Types, flat and pitched, comparison & uses, components, terms related to pitched roof, types of steel trusses, their uses, suitability of different types of roof, materials of construction. |
| 8. | <u>FLOORS</u> :
Types of floors, different materials used, merit and demerit, selection & suitability, procedure for construction. |

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9. FINISHING ITEMS :
Plastering and pointing, difference between the two, their types, different materials used for finishing and their selection.
10. SCAFFOLDING & SITE CLEARANCE :
Purpose of scaffolding & underpinning, different types, importance, situation where it is used, merits and demerits of different types of scaffolding, necessity and procedure of site clearance.
11. MACHINERY & EQUIPMENTS :
List of machines and equipments required during building construction, their suitability.
12. SAFETY & ENVIRONMENTAL ASPECTS :
Safety precautions to be observed during the construction viz. trenching, digging pits for foundation using machineries, masonry works, erection scaffolding, centering etc.
Environmental consideration to be observed during construction of a building e.g. laying out of drainage line and water supply line, soak pit, septic tank, precautions to be taken during site clearance considering environmental effect and avoiding unnecessary cutting of bushes and trees etc.
13. ELEMENTS OF LOW COST HOUSING : via
Necessary Materials appropriate methods and and functional planning.
14. VISITS :
visits should be arranged to have concept of building, procedure of construction machine and equipments used during construction, difficulties and problems met during construction, their solution, a report on these lines should be prepared and submitted to teacher for award of sessional marks, sketches should be drawn where ever required.

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING.
COURSE CODE NO : C- 408
PREREQUISITE : NIL.

LIST OF EXPERIMENTS/SKETCHES/VISITS.

(A) EXPERIMENTS :

1. Testing of concrete for workability.
2. Testing of concrete for compressive strength.
3. Layout of a Room with verandah.
4. Layout of a Residential Building.
5. Layout of a Framed structure.
6. Planning and layout of a Stair case.

(B) LIST OF SKETCHES :

- (a) Various types of foundations.
- (b) Various types of brick bonds and masonry finishing.
- (c) Various types of doors and windows.
- (d) Various types of stairs.
- (e) Various types of scaffoldings.
- (f) Lean to roof with components and details of roofing material.

(C) VISIT :

visit to a site where

- (a) Different types of foundation works are in progress .
- (b) Masonary work in progress.
- (c) Fabrication work is in progress.
- (d) Slab casting is in progress.
- (e) Flooring work is in progress.
- (f) Finished/ completed building.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CIVIL ENGINEERING.
COURSE CODE NO : C- 408
PREREQUISITE : NIL.

LIST OF BOOKS

<u>S.NO.</u>	<u>TITLE</u>	<u>AUTHOR</u>	<u>PUBLISHER.</u>
1.	Building Construction	Sushil Kumar	
2.	Building Construction	Mitchel	
3.	Concrete and Machinery	R.J. Crischoof's	
4.	HandBook for Building Material	National Building Organisation	
5.	Concrete Hand Book	I.C.C Bombay.	
6.	I.S code of Practice		
7.	National Building Code		
8.	Video cassettes on function & planning. Low cost material appropriate technology.		
9.	Literature on Low Cost housing by CER		

Corrected & approved

Sd. A.M. Supkar.

Sd. R.S. Gurudiwan.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

COURSE CONTENTS

COURSE TITLE : WORKS ORGANISATION & MANAGEMENT
COURSE CODE NO : C- 409
PREREQUISITE : NIL
CATEGORY : APPLIED TECHNOLOGY.

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM

DEVELOPED BY : State Curriculum Development Centre
M.P. Board of Technical Education, Bhopal
IN COLLABORATION WITH: Technical Teachers Training Institute,
Bhopal.
SPONSORED BY : Directorate of Technical Education,
Bhopal.
VALUE : Shri Vaishnav Polytechnic,
Indore.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : WORKS ORGANISATION & MANAGEMENT
COURSE CODE NO : C- 409
PREREQUISITE : NIL.

R A T I O N A L E .

A technician of Civil Engineering is required to execute civil works in various departments. The subject of works, Organisation and management is based on P.W.D. code is included as a basic technology course so as to develop abilities of solving day to day problems arising during construction maintenance work.

Handling live problems in the department such as issue of tender documents preparing T.A. Bills & CPM & charts.

Handling of cash book, master Rolls and settlement of imprest account problems etc.

Understand labour laws and successfully dealing with labour and sub-ordinate staff.

In brief the subject works organisation and management has been introduced to develop managerial skills in the students, so that he can successfully handle live situations at work.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : WORKS ORGANISATION & MANAGEMENT.
 COURSE CODE : C- 409
 PREREQUISITE : NIL.

SCHEME OF STUDIES

Hours/Week : Theory (4) Practical (2) Credit : (5)

S.No.	TOPIC	HOURS		
		Theory	Practical	Total.
1.	Introduction	04	-	04
2.	Work by Contract Agency	03	04	12
3.	Work by Department (A) General	12	08	20
4.	Work by Department (B) Measurements & payment	06	-	06
5.	Cash, Bills, Auction & T.A. Rules	08	04	12
6.	Labour Welfare & Laws	04	-	04
7.	Time Schedule for Works.	08	08	16
8.	Management	12	08	20
9.	Miscellaneous	02	-	02
TOTAL		64	32	96

SCHEME OF EXAMINATION

SESSIONAL	PROGRESSIVE		BOARD EXAMINATION			PRACTICAL/VIVA				
	TW	LN	I	II	PAPER	DURA.	MARKS	PRACT.	DURA.	MARKS
20	20	10	10	1	3	100	-	-	-	-

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : WORKS ORGANISATION & MANAGEMENT
COURSE CODE : C- 409
PREREQUISITE : NIL.

COURSE CONTENTS.

Topic No.

1. INTRODUCTION :
Organisation - Major departments executing civil works. Structure of departments staff pattern in division and sub-division, accounting system, types of work done by department, etc.
2. WORK BY CONTRACT AGENCY :
Different methods for executing works in PWD. Preparation of tender invitation of a tender, contract agreement and its different parts, conditions of contract, responsibilities of sub-engineer, site order book, procedure for issuing material, procedure for bills.
3. WORK BY DEPARTMENT (A) GENERAL :
Land acquisition procedure, for material procurement. Use of a quarry chart, different types of accounting papers, procedure for operation of labour rolls, stores procedure and records indent form, accounts of T. & P articles survey report, road metal return, road metal rate book and its use.
4. WORK BY DEPARTMENT (B) MEASUREMENT & PAYMENTS :
Use of measurement book, entries in measurement books, standard measurement book and its use.
5. CASH, BILL, AUCTION & T.A. RULES :
Procedure to settle account of money received, modes of payment, permanent and temporary advance, comparison, checking of bills and vouchers, auction procedure, T.A. rules etc.
6. LABOUR WELFARE & LAWS : Measures to improve the efficiency of labour, causes of accident, trade unions, aims of labour legislation, labour courts, attitudes of sectional officers towards labour.
7. TIME SCHEDULE FOR WORKS : Importance of management of works Gantt bar chart, limitations of chart, CPM network, project chart.
8. MANAGEMENT : CIVIL Engg. Construction industry human resource management, material & equipment managements.
9. MISCELLANEOUS : Necessity of maintain^{ing} a daily diary, need for presence of sub-engineer, A/R & S/R, charge to be handed to be cash transferred, inspection of resthouses.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : WORKS ORGANISATION & MANAGEMENT
COURSE CODE : C- 409
PREREQUISITE : NIL.

LIST OF EXERCISES & VISITS.

(A) EXERCISES :

1. Drafting Notice inviting Tender for various works.
2. Writing measurement books for different works.
3. Preparing muster rolls.
4. Preparing imprest account and temporary advance forms and developing skill for filling in forms.
5. Solving CPM and Net work problems.

(B) VISITS:

1. visit to public sector/ Govt Industry/ organisation.
2. visit to private sector Industry.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHO PAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : WORKS ORGANISATION & MANAGEMENT.
COURSE CODE : C- 409
PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS.

S.No.	Title	Author	Publisher
1.	A.B.C. of PWD Accounts	C.M. Kaul	
2.	Overseer Accounts & Duties	Kumar	
3.	PWD Management, Accounts & Labour Relation	H.S. Pandit	
4.	Construction Management & PWD Accounts	Agarwal & Arora	
5.	CPWD Code		
6.	MPPWD Manual Vol-I & Vol-II.		
7.	CPM & PERT	R.M. Kapoor	
8.	Manual of Labour Relation	R.G. Shrivastava.	
9.	Course content of CTM 506 of Applied Technology Category.		
10.	Civil Engineering management.	C.N. Wadhwa. D.K. Publishers.	
11.	Labour based construction programmes and practical guide for planning & management.	H. Singh.	

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLI.

THREE YEARS DIPLOMA IN CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY & CREDIT SYSTEM.

SUBJECT NAME

1. C -501 Public Health Engineering.
2. C -502 Irrigation Engineering.
3. C -503 Highway Engineering.
4. C/CTM-504 Q.S.C. - I.
5. C/CTM-505 Q.S.C. - II.
6. C/CTM-507 S.D.D. - I.
7. C/CTM-508 S.D.D. - II.
8. C - 509 Project.

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M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL. REVISION ON 15.10.92.
DIPLOMA IN CIVIL ENGINEERING (MPECS)

CATEGORY : APPLIED TECHNOLOGY SCHEME OF STUDIES AND EXAMINATION, OCTOBER, 1992.

S.No.	Code No.	Course	Pre-requi- site.	Th. Pr.	Hrs./Week	Total	Sessional		Board Exami.	Pract./Viva.				
							Lab	work						
1.	C501	Public Health Engg.	-	4	2	5	20	10	1	3 100	1	3	50	
2.	C502	Irrigation.	-	4	2	5	20	10	1	3 100	1	3	50	
3.	C503	Highway Engineering.	-	4	2	5	20	10	1	3 100	1	3	50	
4.	C504	Quantity Surveying	C/CTM 2	6	5	5	20	10	1	3 100	1	3	50	
		CTM 504 & Costing-I(QSC-I) 405												
5.	C505	Q.S.C-II	CTM/C405 2	4	4	4	20	10	1	3 100	-	-	-	
6.	C/CTM 505	Structural Design C/CTM404 3 A		3	5	5	20	10	1	1 100	1	-	50 (Viva.)	
7.	C/CTM 507	& Drawing-I (RCC)		3	4	4	20	10	1	4 100	1	-	50 Viva.	
8.	C/CTM 508	& Drawing-II (Steel)		5	5	5	50	-	-	-	-	-	-	
		Project Minimum Credits 90												
Total							38	140	150	70	7	700	6	300

NOTE:-(1) The student will not be allowed to take up 5th & 6th level courses unless he clears all the Foundation courses.

(2) All the courses common to Diploma in Civil Engg. (MPECS) and DCTM (MPECS) are given the code Nos. as C/CTM whereas the courses only for civil Engg. (MPECS) are given the code No.C/.

(3) The courses common to Diploma in Civil Engg. (MPECS) and DCTM (MPECS) are given the code Nos. as C/CTM whereas the courses only for civil Engg. (MPECS) are given the code No.C/.

(4) Total Marks considering Applied Technology & diversified category.

(1) Sessional Marks : 290 + 80 = 370
 (2) Prog. Asst. Marks : 140 + 40 = 180
 (3) Theory paper Marks. : 700 + 200 = 900
 (4) Practical Marks : 300 + 100 = 400
 Total Credits : 46
 Total Courses : 10

Total Marks : 1430 + 420 = 1850

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : PUBLIC HEALTH ENGINEERING.
COURSE CODE : C- 501 .
PREREQUISITE : NIL.

R A T I O N A L E .

of

One of the basic needs/life is water. It must be supplied to all the people in required quantity and quality. A technician should be well aware and well trained to meet the water and Sanitary requirements of the public, hence the course on PHE is included as an applied technology course. For protection of environment, proper collection, conveyance and disposal of waste water and solid refuse are necessary. This again reinforces the necessity of study of water supply and sanitary engineering in the civil engg. diploma programmes.

This course is aimed mainly at study of water supply and sanitary engineering. Without proper arrangement for house water supply and sanitation, the purpose of municipal water supply and drainage will be defeated. As such, one chapter on this topic has been included. Like all other branches of engineering, Public Health engg. is applicable for urban situation but since lot of our people live in the villages, a chapter on Rural Sanitation has also been included.

In the interest of environment air pollution and noise pollution should be controlled, in addition to water pollution. As such a small portion on pollution has also been included.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
 COURSE : P.H. ENGINEERING
 COURSE CODE : C501
 PREREQUISITE : NIL

SCHEME OF STUDIES

HOURS/WEEK : THEORY (4) PRACTICAL (2) CREDIT : (5)

S.No.	Topic	Theory Hours	Practical Hours	Total Hours
1.	Introduction	01	--	--
2.	Quantity of Water	03	--	--
3.	Sources of Water	03	--	40
4.	Quality of Water	03	--	40
5.	Pumps	02	--	--
6.	Pipes & Pipe Specials	03	--	--
7.	Intakes	03	--	--
8.	Water Treatment Processes	05	--	--
9.	Distribution system	05	--	--
10.	System of Sanitation & Sewage	03	--	--
11.	Quantity of Sewage	03	--	--
12.	Sewer Laying	03	--	--
13.	Waste Water Collection	03	--	--
14.	Sewer Maintenance	02	--	--
15.	Sewage Pumping	03	--	--
16.	Characterstics of Sewage	02	--	--
17.	Sewage Treatment Processes	07	--	--
18.	House water supply & Sanitation.	04	--	--
19.	Rural Sanitation	03	--	--
20.	Pollution.	03	--	--
TOTAL:		64	32	96

SCHEME OF EXAMINATION

TW	Sessional		Progressive		Board Examination		Practical/Viva		
	LW	I	II	Paper	Dura.	Marks	Pract.	Dura.	Marks.
20	20	10	10	1	3	100	1	3	50

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOJAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : P.H. ENGINEERING.
COURSE CODE : C-501
PREREQUISITE : NIL.

TOPIC NO. COURSE CONTENTS

1. INTRODUCTION :
Natural and man made hydrological cycles as applied to P.H.E. Duties of P.H. Engineer.
2. QUANTITY OF WATER
Population forecast by AP, GP and Incremental Increment methods, Criteria for method selection, Factors influencing demand rate. Variations in demand. I.D. demand rates for few types of buildings. Design period. Fire Demand. Total water demand of a city.
3. SOURCE OF WATER
Typing source surface water, ground water, Open well, Tube-well, infiltration well, infiltration gallery, infiltration pipes. construction of dug well. Construction of tube well by percussion method, core drilling method and rotary drilling method. Well developments. Well Testing. Yield of well.
4. QUALITY OF WATER
Effect of different impurities on water, surface/ground Water Water borne diseases. Limits of impurities as per I.C.M.R. Interpretation of test results. Portion on sampling and testing included in practicals but questions may be asked in theory as well selection of source.
5. PUMPS
C.F. Submersible and Air lift Pumps. Selection of pumps. Characteristic curves of CF Pumps. WHP and SHP.
6. PIPES AND PIPES SPECIALS
Type of pipes and their comparison, C.I. pipe specials. CI pipe Joints socket & spigot and Flange. Concrete pipe collar joints: semi flexible and rigid, joints for R.C.C. pressure pipes and PVC Pipes. Ferrous Pipe corrosion and remedies.
7. INTAKES
Functions Location River canal, Reservoir and Lake Intakes.
8. WATER TREATMENT PROCESSES
Steps of treatment. Flow diagram. Coagulation. Commonly used coagulants. comparison. Jar Test coagulant mixing. Flocculator settling Tanks Rectangular with or without mixing channel circular with longitudinal horizontal flow. Filters- slow sand, Rapid Gravity and pressure filter construction, working specification, comparison, use. Disinfection. Chlorinator.
9. DISTRIBUTION SYSTEM
Components, Types, Functions, functional sketch of service reservoir, Requirements and types of distribution systems. valves-slucce reflux air release, air entry, butterfly and hydrant column type-functions and use. Service connection.

10. SYSTEMS OF SANITATION & SEWAGE
Collection of garbage, waste water and domestic sewage. Conservancy and water carried system. Different systems of sewerage. Disposal of garbage.
11. SEWER LAYING
Characteristics for sewer. Dvoid sewer proportion and use. Sewer laying.
12. WASTE WATER COLLECTION
Different patterns of collection system and use. Sewer appurtenances-manhole on straight and junction of two sewers, Drop M.H., Lamp hole, cleanout, street inlet with kerb, channel and kerb-cum-channel inlet, catchpit, Oil & grease trap, Grit chamber, Combined grit and grease chamber, Flushing Tank, Leaping and overflow sewer, Siphon spillway, ventilation shaft, sketches, functions and locations.
13. QUANTITY OF SEWAGE
Sources, Factors affecting quantity. Variation of sewage flow. Functional types of sewers.
14. SEWER MAINTENANCE
Tools used cleaning a clogged sewer. Repair to a masonry pipe sewer.
15. SEWAGE PUMPING
Common troubles and remedies, layout of pumping station. Air ejector-sketch, working and layout.
16. CHARACTERISTICS OF SEWAGE
Characteristics of different types of bacteria sewage strength significance of different tests.
17. SEWAGE TREATMENT PROCESSES
Nature of treatment by three stages. Functions of screen and grit chambers. Rectangular and circular settling tanks. Trickling Filter, Activated sludge process. Stabilisation pond, sludge Digester sketches, functions, working, advantages and disadvantages. Comparison among the secondary treatment methods. Sludge drying beds Flow Diagram. Disposal of liquid effluent Dilution and Irrigation brood, ridge and burrow, sub-surface and spray:- Comparison, Septic Tank and secondary treatment and disposal of septic tank effluent by soil absorption system as per IS2470-specifications and situation for use of pits or galleries for secondary treatment. Design of septic tank for small and large residential installation, given no. of users, rate of influent Design for secondary treatment for septic tank effluent given no. of users, rate of influent and site conditions. Common Complaints in the operation of septic tank and remedies.
18. HOUSE WATER SUPPLY AND SANITATION
Water Supply and sanitary fitting-union, coupling,cocks, valve, flushing tank nahani trap,W.C. Indian,Anglow-Indian and western type Gully trap, Fresh Air Inlet,Ventilating cowl. Water seal,trap, antisiphonage pipe, Systems of plumbing and comparison. Inspection chamber, Intercepting chamber. Pipe special-single junction, double junction.
19. RURAL SANITATION
Principles of rural sanitation, Sources of rural water supply. Disposal of garbage, sullage and night soil. (Pit privy and Bore hole latrine)
20. POLLUTION
Definition of pollution,pollutant, water pollution, air pollution and noise pollution.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
PHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : PUBLIC HEALTH ENGINEERING.
 COURSE CODE : C-501
 PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS.

S.No.	Title	Author	Publisher
1.	Hu-sain, S.K., "Textbook of water supply and San-itary Engg." Oxford and IBH Publishing Co., New Delhi.		
2.	Birdie, G.S. and Bridie, J.S. "Water Supply and Sanitary Engg" Dhanpat Rai & sons, Delhi.		
3.	Sunil and Rajjan, "Jal Apiti Evam Swachchhata Inginiary" (in Hindi), Navbharat Prakashan, Meerut.		
4.	Mahida, U.N., "Water Pollution", T.M.H., New Delhi.		
5.	Magill, P.L. Holden, F.R. and Ackley, C., "Air Pollution Handbook," McGraw Hill Book Company, .		
6.	The committee on PHE Manual and code of practice, The Ministry of Health, Govt. of India, "PHE Manual and code of practice- sections I, II, III and IV.		
7.	I.S.: 1172, 1742, 2065, 2470 and 5329.		
8.	Saxena, A.K. "Lok Swasthya Yantriki" (In Hindi) Deepak Prakashan, Gwalior.		
9.	Water supply & sewerage by Steel		

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : PUBLIC HEALTH ENGINEERING.
COURSE CODE NO : C- 501
PREREQUISITE : NIL.

LIST OF EXPERIMENTS/VISITS

1. Turbidity test.
2. Colour test.
3. Test for PH, Hardness, Chlorides, Iron & manganese.
4. Test for B-Coil.
5. Test for residual Chlorine.
6. Test for total, volatile, fixed, suspended and settleable.
7. Test for D.O., B.O.D., C.O.D. and sterbability.

VISITS :

1. Intake site and adjoining pumping station.
2. Water treatment plant and testing lab.
3. Sewage treatment plant.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : IRRIGATION
COURSE CODE : C- 502
PREREQUISITE : NIL.

RATIONALE.

India is an agricultural country hence Irrigation Engineering is the subject of vast importance. During the Job in irrigation, a technician has to perform various activities including preproject surveys, project planning including designing based on irrigation manuals, layout and actual execution of works, maintenance of canal systems etc. The knowledge of various course components will help the students

to perform his job functions in the field, where there is a high job potential for civil engineering technician.

To make understanding easier, various work site visits are also suggested and recommended in the syllabus, which will provide more chances of exposures to students at actual work site. To reinforce the theoretical concepts, the students should be given exposure to some project prepared in the irrigation department, so that they can understand the procedure of project preparation.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : IRRIGATION
COURSE CODE : C- 502
PREREQUISITE : NIL

SCHEME OF STUDIES

HOURS/WEEK : THEORY (4) PRACTICAL (2) CREDIT:(5)

S.No.	Topic	HOURS		
		Theory	Practical	Total.
1.	Introduction	03	00	03
2.	Hydrology	04	00	04
3.	Water Requirement of Crops	07	00	07
4.	Survey for Irrigation Projects	07	00	07
5.	Storage Works	14	00	14
6.	Diversion Works	06	00	06
7.	Canal Works	10	00	10
8.	Lift Irrigation schemes	05	00	05
9.	Machinery & Equipment	03	00	03
10.	Water Management	05	00	05
11.	visits to various work sites	-	32	32
TOTAL		64	32	96

SCHEME OF EXAMINATION

TW	SESSIONAL		PROGRESSIVE		BOARD EXAMINATION		PRACTICAL/ VIVA		
	LW	I	II	PAPER	DURA.	MARKS	FRACT.	DURA.	MARKS.
20	20	10	10	1	3	100	1	3	50

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : IRRIGATION
 COURSE CODE : C- 502
 PREREQUISITE : NIL.

COURSE CONTENTS

TOPIC NO.

1. INTRODUCTION
Necessity, Importance, benefits, ill effects, methods.
 2. HYDROLOGY
Definitions, hydrological cycles, rainfall, runoff, flood discharge.
 3. WATER REQUIREMENT OF CROPS
Function of water, various crops of area, crop season, delta, duty, crop rotation.
 4. SURVEY FOR IRRIGATION PROJECTS
Importance of survey, various types, information collected, reasonability and feasibility of projects.
 5. STORAGE WORKS
Components of storage works various zone of storages various types of dams, their suitability, construction materials and procedures, foundation treatment.
 6. DIVERSION WORKS
Components of diversion works, types functions and suitability, weirs & their types.
 7. CANAL WORKS
Components of canal work, type of canal, alignment, design of canal and different structures in canal network, canal lining.
 8. LIFT IRRIGATION SCHEMES
Importance source of water, suitability, advantages & limitations.
 9. MACHINERY & EQUIPMENT : Various Machine functions & suitability list of equipment their uses.
 10. WATER MANAGEMENT : Irrigation act, agreement, revenue. various terminology used in act.
 11. VISIT TO VARIOUS WORK SITES :
 - (a) To a construction site where foundation work/Dam construction is under progress.
 - (b) To an existing completed dam site where its all operation are in full running.
 - (c) To a canal site, where all the components of an canal net work are in running condition.
 - (d) To observe the various earth moving equipments at the Machine and study their working.
 - (e) To a preproject survey site (if possible) where preliminary survey work is in the progress.
- NOTE:- Students will prepare & submit a report on the basis of the informations they have collected during the visits. Which will be discussed during practical examinations.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : IRRIGATION
COURSE CODE : C-502
PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS.

S.No.	TITLE	AUTHOR	PUBLISHER
1.	Irrigation and water power Engineering.	B.C. Purmia	
2.	Introductory Irrigation Engg.	B.C. Purmia	
3.	Fundamental Principle of Irri. Engg.	V.B. Priyani	
4.	Fundamental Principles of Irri. Engg.	Bharat Singh	
5.	Irrigation Engg. & Hydraulic structures	S.K. Garg	
6.	Principles of Irri. Engg.	S.K. Verma.	
7.	Irrigation Engg.	Birdie.	

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

DETAILED - CURRICULUM

COURSE TITLE : HIGHWAY ENGINEERING.
COURSE CODE NO : C-503
PREREQUISITE : NIL.
CATEGORY : APPLIED TECHNOLOGY

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM

DEVELOPED BY : STATE CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL.

IN COLLABORATION WITH : TECHNICAL TEACHERS TRAINING INSTITUTE,
BHOPAL

SPONSORED BY : DIRECTORATE OF TECHNICAL EDUCATION,
BHOPAL.

VALUE : SHRI VAISHNAV. POLYTECHNIC,
INDORE

MIDHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HIGHWAY ENGINEERING
COURSE CODE NO : C- 503
PREREQUISITE : NIL.

R A T I O N A L E.

One of the job functions^{of} a civil engineering technician is construction and maintenance of highways and bridges. This needs knowledge of planning and development of highways, preliminary surveys and construction of highways.

This curriculum of highways engg. is also intended to develop abilities in the fields of highway projects, so that a technician can select equipments & supervise construction of roads & bridges and also to maintain them by solving live problems at site.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : HIGHWAY ENGINEERING
COURSE CODE : C- 503
PREREQUISITE : NIL.

SCHEME OF STUDIES

HOURS/WEEK : THEORY (4) PRACTICAL (2) CREDIT : (5)

S.NO.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Introduction	02	-	02
2.	Investigation & Planning for New Roads	08	-	08
3.	Road Geometrics	08	-	08
4.	Pavement Design & Construction	12	-	12
5.	Drainage of Roads	03	-	03
6.	Traffic Engineering	04	-	04
7.	Arboriculture	02	-	02
8.	Road Maintenance	03	-	03
9.	Bridge Engineering	22	-	22
10	Project	-	32	32
TOTAL		64	32	96

SCHEME OF EXAMINATION

TW	SESSIONAL		PROGRESSIVE		BOARD EXAMINATION			PRACTICAL/ VIVA		
	IM	I	II	PAPER	DURA.	MARKS	PRACT.	DURA.	MARKS.	
20	20	10	10	1	3	100	1	3	50	

7. ARBORICULTURE
Road side arboriculture, necessity, planning of plantation of trees selection of types of trees and development of nursery. Considering the environment aspects.
8. ROAD MAINTENANCE
Defects of Roads and various pavements, pavement failures, causes and repairs, Defects in cement concrete roads, causes of defects, repairing procedure, strengthening of existing pavements.
9. BRIDGE ENGINEERING
 - A. COMPONENT AND CLASSIFICATION :
Introduction, difference between bridge and culvert, components of a bridge, various terminology used, main classification of Bridges, requirements of an ideal bridge and identification of bridges, standards of loading for bridge Design as per IRC.
 - B. SITE INVESTIGATION AND HYDROLOGY :
Selection of bridge site, ideal bridge site characteristics, bridge alignment and collection of bridge design data, Determination of flood discharge, waterway economic span, scour depth, afflux, standard values of clearance and free board as per IRC.
 - C. SUBSTRUCTURE AND SUPER STRUCTURE :
Types of bridge superstructure, bridge floorings and their selection, bridge piers, Abutments, wingwalls, approaches, bridge bearings and joints in bridges.
 - D. CONSTRUCTION AND MAINTENANCE :
Erection of steel girder and truss bridges, erection of RCC bridges and suspension bridges, maintenance methods.
10. PROJECT
Field work for at least 2Km road . distance including one cross and small drainage work.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
COURSE : HIGHWAY ENGINEERING
COURSE CODE : C-503
PREREQUISITE : C - 401

LIST OF REFERENCE BOOKS

S.No.	TITLE	AUTHOR	PUBLISHER
1.	HIGHWAY ENGG.	S.K.KHANNA & JUSTO	NEMI CHAND JAIN ROORKEE
2.	HIGHWAY ENGG.	N.K.VASWANI	ROORKEE PUB.HOUSE
3.	HIGHWAY ENGG.	S.B.SENGAL	S.CHAND & CO.
4.	PRINCIPLE & PRACTICE OF HIGHWAY ENGG.	L.R.KADIVALI	KHANNA PUB.DELHI
5.	A COURSE IN HIGHWAY ENGG.	S.P. BINDRA	DHANTAT RAI & SONS
6.	FOUNDIMENTAL PRINCIPLES OF ROAD ENGG.	V.B. PRIYANI	CHARTER BOOK STALL ANAND
7.	INDIAN ROADS CONGRESS PUBLICATIONS.		
8.	TRAFFIC ENGINEERING.		

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING - I.
COURSE CODE NO : CIVIL - 504
PREREQUISITE : CTM 405

R A T I O N A L E .

Preparation of quantity and cost estimates of the various items/ works is a major job function of a Diploma passout in the field of Construction Technology and Management. The course therefore, aims in developing in the student competency in preparing estimates of all types of Civil Engineering Structures. For achieving this the student is made familiar with the procedures and principles of measuring various works, estimating its cost and computing quantities of material needed. After learning the principles and procedures student applies them to prepare Estimate cost of various types of buildings, Earthwork and Road work estimates.

Though 128 hours are provided for the treatment of curriculum all types of structures cannot be covered in this duration in classroom. However using basic principles the student can prepare estimates of any type/structure by referring to the working drawing.

To ensure that the student has developed the desired competence in preparing estimates he may be given appropriate exercises.

* * *

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING COSTING - I.
COURSE CODE NO : CIVIL - 504
PREREQUISITE : CTM 405

SCHEME OF STUDIES.

<u>TOPICS</u>	<u>ALLOCATED HOURS</u>		<u>TOTL.</u>
	<u>TH</u>	<u>PR.</u>	
1. Introduction.	1	1	1
2. Stage I or approximate Estimate	3	1	3
3. Taking out Quantities.	6	18	24
4. Use of Schedule of Rates.	4	12	16
5. Analysis of Rates.	2	10	12
6. Stage II or detailed. Estimate for Buildings.	8	26	34
7. Earth work Estimates.	8	30	38

TOTL	32	96	128

CREDITS 4 5

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING- I.
COURSE CODE NO : C-504
PREREQUISITE : CTM 405

TOPIC-1. INTRODUCTION:

Purpose of Estimate and its importance to the field situations.

TOPIC-2. STAGE I OR APPROXIMATE ESTIMATE :

Approximate method of Stage I Estimate.

- Service Unit Method.
- Plinth area Method.
- Cubic content Method.

Approximate Methods for water supply, Sanitary and Electrical installations.

Different Civil Engineering structures.

Like, Bridge, Culvert, Road, Dams over head tanks.

TOPIC-3. TAKING OUT QUANTITIES :

Units of measurements, Different items of work required in estimating building works.

Accuracy in Measurement and Calculating Quantities

Long and short wall Method.

Centre line Method.

Standard conversion used in measurements,

Taking out quantities from working drawing of building.

Taking out quantities in building during construction.

TOPIC4- USE OF SCHEDULE OF RATES :

Information available in schedule of Rates with specification of particular item.

- Labour Rates.
- Material Rates
- Transportation Rates.

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TOPIC-5. ANALYSIS OF RATES :

- Purpose of Rate Analysis.
- Task Artisan per day
- Materials required for major items.
- Labour required for major items.
- Analysis of Major items of work.

TOPIC-6. STAGE II OR DETAILED ESTIMATE FOR BUILDINGS.

- Pre-requisite for stage II estimate.
- Preparation of Abstract from quantity sheets,
- Percentage provision to be made in stage II estimate for some items.
- Classification of Estimates
 - Original work
 - Special repair work
 - Addition/Alternation work
 - Revised Estimate.
 - Annual Repairs.
 - Final Estimate.
- Preparation of detailed Estimate for.
 - Small Residential building.
 - Small Residential building with pitched roof.
 - Shop cum residential Multi-storied Building.

TOPIC-7. EARTH WORK ESTIMATE :

Calculation of Area of cross section for given cross sections:-

- (1) Fully cutting section.
- (2) Partly cutting and partly embankment section
- (3) Fully embankment section.

Calculation of earth work by using prismatic Formula, Trapezium Formula, Lead and lift.

Estimate of Earth work for 1 Km. Road.

- Using sealing coat as Macadam.
- Using sealing Coat as bitumen.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING- I.
COURSE CODE NO : C- 504
PREREQUISITE : CTM 405

SUGGESTED WORK FOR PRACTICE/TERM WORK.

1. Workout the quantities of all items of work for a single storey residential building with Flat Roof.
2. ~~-do-~~ with pitched Roof.
3. ~~-do-~~ shop cum residential double storeyed building.
4. RATE ANALYSIS FOR.
 - (1) Brick Masonry.
 - (2) Excavation in Foundation.
 - (3) Cement concrete.
 - (4) Cement Mortar.
 - (5) Flooring.
 - (6) Wood work.
5. Estimate of earth work for different sections.
6. Estimate of Road of 1 Km. length for pavement surface.
 W.B.M.
 Bitumen.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING I.
COURSE CODE NO : C- 504
PREREQUISITE : CTM 405

LIST OF REFERENCE BOOKS.

1. Estimating and Costing : By B.N. Dutta
S. Datta & Co.
Tagore Path
Motilal Bose Rd.
Lucknow.
2. Estimating & Costing
and
Valuation. : By Rangwala
Charter Publications
Station Road
Anand.
3. Estimating & Costing. : By Birdie
J.C. Kapoor
for Dhanpat Rai & Sons
Delhi & Jullunder.
4. Estimating & Costing Vol I
& Vol. II. : By J.C. Malhotra
Khanna Publishers
2B, Nath Market
Nai Sarak
New Delhi.
5. Current schedule of Rates from
PWD/RE/Irrigation Deptts.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLI.

- PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING II.
COURSE CODE NO : C- 505
PREREQUISITE : (i) CTM 405
(ii) CTM 504

R A T I O N A L E.

One of the job specifications of a diploma holder is to prepare estimate of civil Engineering structures as for cost and quantity of various construction materials required. This is an essential and basic requirement for all projects.

This is the first step towards efficient management of the project including proper estimation and utilisation of human resources required for the project.

This subject is in continuation of quantity surveying and costing-I.

In this chapters, the timber structure, R.C.C. Structures and steel structures Bridge and culverts, water supply and sanitary Engineering are included. The students will be able to calculate the quantity of works of the structures of the above mentioned chapters.

A chapter on valuation and rent fixation is also included so that the students will be familiar with the method for valuation work and fixing rent.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING & COSTING II.
COURSE CODE NO : C- 505
PREREQUISITE : CTM 405 AND CTM 504

S.NO.	Topics.	ALLOTED HOURS		TOTAL
		Theory	Pract.	
1.	Estimate of Timber Structures.	02	04	06
2.	Estimate of R.C.C. Structures.	06	12	18
3.	Estimate of Steel Structures.	04	08	12
4.	Estimate of culverts and Bridges.	06	12	18
5.	Estimate of water supply and Sanitary fittings.	06	12	18
6.	Valuation and Rent Fixation.	08	16	24

TOTAL		32	64	96

CREDITS - 4

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
COURSE : QUANTITY SURVEYING & COSTING II.
COURSE CODE NO : C- 505
PREREQUISITE : CTM 405 AND CTE 504

TOPIC-1. ESTIMATE OF TIMBER STRUCTURES:

- Estimate of Doors and windows
- Estimate of king post Roof Truss.
- Estimate of Roof covering material (Tiles).

TOPIC-2. ESTIMATE OF R.C.C. STRUCTURES.

- Estimate of slab.
- Estimate of beam.
- Estimate of T-beam.
- Estimate of Staircase from & with actual working Drawing.
- Estimate of R.C.C. column with its footing.
- Preparation of Abstract of above items.
- Preparation of Bar banding schedule, and to calculate amount of steel.

TOPIC-3. ESTIMATE OF STEEL STRUCTURES.

- Estimate of steel column (Stanchion)
- Estimate of steel Truss and Gussset Plate.
- Estimate of Roof covering materials.
G.I. Roof, A.C. Roof.
- Estimate of Steel frames for Doors & Windows.

TOPIC-4. ESTIMATE OF CULVERTS AND BRIDGES.

- Estimate of R.C.C. slab bridge, straight type wing walls.
- Estimate of R.C.C. slab bridge, straight type wing walls.
- Estimate of R.C.C. slab bridge, straight type wing walls.

TOPIC-5. ESTIMATE OF WATER SUPPLY AND SANITARY FITTINGS.

- Detailed Estimate of Water supply for building work.
- Detailed Estimate of Sanitary works for building work.
- Estimate of S.W. pipe line.
- Estimate of Septic tank.
- Estimate of Manhole.

TOPIC-6. VALUATION & Definition, Purpose of valuation.

- Gross income/Net income.
- Out goings.
- Sinking fund.
- Obsolescence and depreciation.
- Capitalized value and year purchase.
- Methods of Depreciation, Methods of valuation, Lease and Free hold property. Rent fixation of building.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : QUANTITY SURVEYING- II.
COURSE CODE NO : C- 505
PREREQUISITE : CTM 405
&CTM 504

LIST OF REFERENCE BOOKS.

1. Estimating and Costing By B.N. Dutta
S.Patta & Co.
Tagore Path
Motilal Bose Road,
Lucknow.
2. Estimating, Costing and Valuation. By Rengwala
Charotar Publications
Anand.
3. Estimating & Costing. By Birdie & J.C.Kapoor
Dhanpat Rai & Sons
Delhi.
4. Estimating and costing vol. I & vol. II. By J.C. Malhotra
Khanna Publishers
2B, Nath Market
Nai Sarak, Delhi.
5. Current schedule of rates from P.W.D./P.H.E./Irrigation.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING I (R.C.C.)
COURSE CODE NO : C- 507
PREREQUISITE : CTM 404

R A T I O N A L E.

The technician in construction Technology must have the concept of R.C.C. and should also be able to design simple R.C.C. structures, though he is not required to design complicated R.C.C. structures.

Keeping this view in mind the course of R.C.C. is so designed that a technician in construction technology develop a concept, ^{of} theory of R.C.C, gradually and finally will be able to design simple R.C.C. structures such as beam, slab column etc.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

programme : Diploma in civil engineering.
Course : Structural Design and Drawing - I.
Course code No : C- 507
prerequisite : CTM 404

SCHEME OF STUDIES.

	HOURS		
	Theory	Practical	Total
(1) Introduction.	04	03	07
(2) Theory of R.C.C.	08	03	11
(3) Design of Beam.	20	04	24
(4) Design of slab.	08	04	12
(5) Design of "Tee" Beam with slab.	10	08	18
(6) Design of column and its footing.	06	04	10
(7) Design of staircase.	08	06	14

TOTAL	64	32	96

CREDITS - 5

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING.-I
COURSE CODE NO : C- 507
PREREQUISITE : CTM 404

DETAILS OF CONTENTS.

1. INTRODUCTION : S.I. Units, Meaning of R.C.C. purpose of reinforcement. Materials of reinforcement steel as a reinforcing material.

Types of steel used for reinforcement mild steel, Tor steel, permissible stresses in concrete and steel, different mixes of concrete to be used for R.C.C. work. Use of I.S. Code No. 456-1978 and I.S. 875-1984 for designing R.C.C. structures.

2. THEORY OF R.C.C. : Concrete bending stress diagram for a rectangular concrete beam. Neutral Axis and Neutral layer. Effect of reinforcement on Neutral layer. Critical and Actual N.A. Balanced, under reinforced and over reinforced section.

Moment of resistance percentage of steel on N.A. working stress method design and effect of limit state design. Shear stress, Bond stress, Bond length, Layout of columns and beams, in building hall Design of R.C. structures are to be made by limit state method adopting above I.S. codes.

3. R.C.C. BEAM : Design of singly, doubly reinforced and cantilever beams completely.

4. DESIGN OF SLAB : Design of one way Two way cantilever slab
Design of R.C. Chajja with lintel.
5. DESIGN OF "TREE" BEAM AND CONTINUOUS SLAB.
6. Theory and Design of R.C. column and column footing.
7. DESIGN OF STAIR CASE - Constructional and structural design
of Dog Legged type stair case and open well type stair
case.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING-I (R.C.C.)
COURSE CODE NO : C- 507
PREREQUISITE : CTM 404

LIST OF WORKING DRAWING WITH BAR BENDING SCHEDULE TO BE
PREPARED.

1. Arrangement and position of column and beam for a building, and a big hall.
2. Longitudinal section, Cross section of singly reinforced beam with bar bending schedule.
3. Longitudinal section, Cross section of Doubly reinforced beam.
4. R.C.C. Chajja with lintel.
5. Longitudinal section, Cross section and Plan of one way RC slab with schedule of reinforcement.
6. Two way slab.
7. Tee beam and slab.
8. Column and its footing.
9. Stair case.

* * *

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING - II.
COURSE CODE NO : C- 508
PREREQUISITE : CTM 404

SCHEME OF STUDIES.

<u>Topic No.</u>	<u>Name of Topic</u>	<u>Hrs. Th.</u>	<u>Hrs. Pr.</u>	<u>Total</u>
1.	Introduction.	04	02	06
2.	Riveted joint.	08	06	14
3.	Tension Member.	06	-	06
4.	Compression member.	06	-	06
5.	Column bases and column Footing.	04	08	12
6.	Roof Truss.	14	16	30
7.	Timber structures.	06	-	06

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TOTAL PERIODS 48 32 80
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CREDITS - 4

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING - II.
COURSE CODE NO : C- 508
PREREQUISITE : CTM - 404

1. INTRODUCTION :
Examples of steel structure, I.S. code 800. Structural Steel Section, Loads, D.L., L.L, W.L, Allowable stresses.
2. RIVETED JOINTS :
Rivets, types, Nominal dia, clearance, Gross dia. Unwin's formula, Pitch of rivets, Edge distance, Tacking rivets, permissible stress in rivet, Types of riveting, Power driven shop riveting, power driven field driven etc. Types of riveted joints Lap joint : Butt joint. Eccentric riveted connection welded joint, Strength of welded joint, types of welded joint and Design of welded joint.
3. TENSION MEMBER :
Sections may be used as tension member. Net sectional effective sectional area of single L Iron and Double angle iron. Design of a tension member.
4. COMPRESSION MEMBER :
Criteria of Failure of short column and long column End conditions Effective length of a column, Slenderness ratio and corresponding compressive stress: Design of column and compound column consisting of two channels design of lacing angles and Batten plates
5. COLUMN BASES :
Types- Slab base and Gusseted base. Design of M.S. slab base with concrete pedestal. Cleat angles, their use only.
6. ROOF TRUSS :
Types of Trusses, Span and slope, Rise and pitch, loads Levels on the Roof. Combination of loads for design of truss. Selection of types of truss, Forces in the members, lintels Design of members of truss, Design of purlin. Detailing of different Roof joints and purlin connection.
7. TIMBER STRUCTURES :
Grades of timber- stress in timber. Factors affecting stress/Strength of timber. Types of timber column, slenderness ratio. Short column, Intermediate column and Long column and their design. Design of laterally supported timber beam.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING II (STEEL)
COURSE CODE NO : C- 508
PREREQUISITE : CTM 404

LIST OF PLATES/SKETCHING.

1. Sketching of different types of rivets and steel section.
2. Sketching of different types of riveted joints.
3. Details of steel column and its complete details.
4. Details of built up column and its base.
5. Graphical solution of frames to find out the stress in the member.
6. Stress diagra for D.L., W.L. for given loads on a truss.
7. working drawing of steel truss with the details of joint.

* * *

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : STRUCTURAL DESIGN AND DRAWING II (STEEL)
COURSE CODE NO : C- 508
PREREQUISITE : CTM 404

REFERENCE BOOKS

1. Steel structures By Ramangatham.
2. Structural Engg. vol. IV.(steel) By Vazirani.
3. Steel structures By Ramchandra.
4. Steel structures By Arya and Ajmani.
5. Steel structures Code By Malhotra. M.M.
6. I.S./ 800
7. Steel structure By R.K.Dhoble.
&
D.S. Dharmadhikari.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

DETAILED - CURRICULUM

COURSE TITLE : PROJECT
COURSE CODE NO : C- 509
PREREQUISITE : MINIMUM 90 CREDIT
CATEGORY : APPLIED TECHNOLOGY

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM

DEVELOPED BY : STATE CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL

IN COLLABORATION WITH: TECHNICAL TEACHERS TRAINING INSTITUTE,
BHOPAL.

SPONSORED BY : DIRECTORATE OF TECHNICAL EDUCATION,
BHOPAL

VANUE : SHRI VAISHNAV POLYTECHNIC,
INDORE.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : PROJECT
COURSE CODE : C- 509
PREREQUISITE : MINIMUM 90 CREDIT

R A T I O N A L E.

The project work is an important subject, which aims at closer co-ordination and integration between theory and practice. It gives access to the wider range of field techniques, helps to develop planning and decision making skills. It develops confidence in students to work independently, participating in group task, helps in comprehending knowledge of various subjects, in practical aspect apart from what is taught in classroom and also helps in tackling live problems.

Major project is prescribed so that a student gets complete idea of planning and estimating a project and writing a project report.

The minor project work will also help the student to be acquainted with modern materials, equipments and the market cost analysis.

The overall project work will help the student to become an entrepreneur then depending on govt. jobs and services.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOJAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : PROJECT
 COURSE CODE : C- 509
 PREREQUISITE : MINIMUM 90 CREDIT

SCHEME OF STUDIES

HOURS/WEEK : THEORY () PRACTICAL (5) CREDIT : (5)

S.No.	TOPIC	HOURS		Total
		Theory	Practical	
1.	Introduction.	-	-	-
2.	selection of project	-	-	-
3.	Planning of Project	-	-	-
4.	Field works	-	-	-
5.	Potting	-	-	-
6.	Preparation of Plans	-	-	-
7.	Estimation	-	-	-
8.	Conclusion	-	-	-
TOTAL		00	80	80

SCHEME OF EXAMINATION

SESSIONAL	PROGRESSIVE		BOARD EXAMINATION			PRACTICAL / VIVA.	
	TW	LW	I	II	PAPER DURA. MARKS	PRACT. DURA. MARKS.	MARKS.
-	50	-	-	-	-	1	3 50

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : PROJECT
COURSE CODE : C- 509
PREREQUISITE : MINIMUM 90 CREDIT

COURSE CONTENTS

TOPIC NO	COURSE CONTENTS
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1. INTRODUCTION
Importance of project work, guide line and general introduction.
2. SELECTION OF PROJECT
Selection of any project from irrigation, PHE, PWD etc., Connected with city or town where the polytechnic is situated.
3. PLANNING OF PROJECT
Planning of field work, line of action, work distribution, data to be collected by different batches.
4. FIELD WORK
Survey for the project, data collection etc.
5. PLOTTING
To plot the different maps from the data collected in the field.
6. PREPARATION OF PLAN
Preparation of plans, working drawings, detailed drawings & designs etc.
7. ESTIMATION
Preparation of detailed and abstract estimates.
8. CONCLUSIONS
Discussions on feasibility of scheme and preparation of technical report.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : PROJECT
COURSE CODE : C- 509
PREREQUISITE : MINIMUM 90 CREDITS

LIST OF MAJOR/MINOR PROJECTS

MAJOR PROJECTS : ANY ONE OF THE FOLLOWING:-

1. P.H.E. project.: Water supply, sewage disposal, scheme of colony.
2. Town Planning : Colony development, marketing centre, Industrial area.
3. Highway engineering : Construction of a new road including calculating earth work design of curve preparing estimate calculation for cross drainage estimate for total cost writing project report.
4. Traffic Improvement: Parking place, crossing, Islands.
5. Irrigation work : Preparation of estimate on the basis of report related with building work.

MINOR PROJECTS : INCLUDING MARKET SURVEY :

1. Flooring materials.
2. Doors and windows.
3. Water proofing materials.
4. Chemical added to cement.
5. Partition material.
6. Construction equipments.
7. Centering materials.
8. Labour task work. Such as mason, Carpenter, plumber painter etc.

THREE YEARS DIPLOMA PROGRAMME IN
CIVIL ENGINEERING.
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM SCHEME

<u>C</u> - 601 CTM	FABRICATION & ERECTION.
C - 602	RAILWAY & TUNNEL ENGG.
C - 603	CONCRETE TECHNOLOGY
C - 604	ADVANCE BUILDING CONST.
C - 605	MAINTENANCE ENGINEERING.
<u>C</u> - 606 CTM	ADVANCE ENVIRONMENTAL ENGG.
<u>C</u> - 607 CTM	COMPUTER AIED DESIGN.
<u>C</u> - 608 CTM 511	ADVANCED ENTREPRENEURSHIP & EQP. EQUIVALENT ADVANCED ENTREPRENEURSHIP & PROJECT OF CTM511

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M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL. REVISED ON 15.10.92
 DIPLOMA IN CIVIL ENGS. (MPECS)
 SCHEME OF STUDIES AND EXAMINATION, OCTOBER, 1992.

CATEGORY: DIVERSIFIED:

S.No.	Code No.	Course Title	Pre-requi- sits.	Th.	Pr.	Hrs./week	Total dits.	Cre- dit.	Term Lab	Sessional work	Progressive work	Board Exan. paper	Dur.	Mks.	Pract. Dur.	Mks.	Viva.											

1.	C/CTM 601	Fabrication & Erection.	C508	3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
2.	C602	Railways & Tunnel.		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
3.	C603	Concrete Technology		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
4.	C604	Advance Construction Technology.		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
5.	C/CTM 605	Advance Environmental Engineering.		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
6.	C606	Maintenance Engineering.		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
7.	C/CTM 607	Computer Aided Design.		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
8.	C608	Advance Entrepreneurship & EQP. same as CTM 511 (Advanced Entrepreneurship & Project)		3	2	2	4	20	20	20	10	10	1	3	100	1	3	50										
													Total		8		40		20		20		2		200		100	

NOTE:- (1) Any two courses are to be offered by the student.
 (2) The courses common to Diploma in Civil Engrs. (MPECS) are given the code Nos. as C/CTM whereas the courses only for Civil Engrs. (MPECS) are given the code No.C.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

DIPLOMA COURSE IN CIVIL ENGINEERING.

C- 601 FABRICATION AND ERECTION.

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DIPLOMA COURSE IN CIVIL ENGG.

C- 601 FABRICATION AND ERECTION

R A T I O N A L E.

The Diploma programme in Civil Engineering has an emphasis on entrepreneurship. The passouts are expected to be self employed. With this end in view, the course content of "FABRICATION AND ERECTION" has been drafted. The topics of this course are so selected that they are helpful for the diploma holders / to become an entrepreneur. In addition to theory in the class room, a lot of emphasis has been given on practicals and field visits. During field visits they will get an idea of the equipments used and processes in Fabrication and Erection.

A Topic on safety and hazards has also been included.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : FABRICATION AND ERECTION.

COURSE CODE NO : (CIVIL) G-601

PREREQUISITE : CTM 508 (SDDII- STEEL)

SCHEME OF STUDIES

S.No.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Introduction	06	-	06
2.	Types of structure	04	-	04
3.	Welded Joints	06	05	11
4.	Fabrication	10	10	20
5.	Handling Equipment	06	-	06
6.	Erection of Structure	06	-	06
7.	Safety and Hazards	04	-	04
8.	Costing of Fabricated structure.	06	-	06
9.	Field visits	-	17	17
TOTAL		48	32	80
CREDITS- 4				

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SCHEME OF EXAMINATION

Course Code No.	Hours:		CREDITS	Sessional Marks		Prog- rressive Assess- ment		Board paper		Practical/ Viva	
	Theo.	Pra.		Term work	Lab work	I	II	No.	Du- Th.	No.	Du- Th.

CTM 601	3	2	4	20	20	10	10	1	3	100	1	3	50
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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : FABRICATION AND ERECTION.

COURSE CODE NO : C- 601

PREREQUISITE : CEM 508 (SDD II - STEEL)

CONTENTS

- TOPIC-1 INTRODUCTION:- Permissible stresses in structural steel of different grades as per I.S.I. Various standard sections used in steel structures and their properties different types of connections for fabrication works, namely, riveted, bolted, welded and pin connections. Types of rivets based on shape and size of steel sections, weld, rivets and bolts for structural purpose. (only) introduction to riveting, bolting. Emphasis on welding only).
- TOPIC-2 TYPES OF STRUCTURES:- Sketches of various types of structural system such as beam, girder, column, truss, portals, industrial bent, plate girder and column bases. Uses of various structures in different situations.

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TOPIC-3

WELDED JOINTS:-EQUIPMENTS AND MATERIALS for

welding, welding process, weld defects, causes and remedial measures. Brazing, protection of fabricated material against corrosion and erosion. Sandblasting safety during welding operation.

TOPIC-4

FABRICATION:- Fabrication process, steps for

fabrication marking and template marking, layout prefabrication operation, straightening methods (manual, machine, hot straightening), marking, cutting, bending, drilling, punching, joint preparation. Introduction to stress relieving after fabrication.

Fabrication of steel grills, joints for steel truss. Equipments to include shearing machine press brakes, bending machine, angle cutting machine.

TOPIC-5

HANDLING EQUIPMENT:- Equipments used in

fabrication shop such as jack, pulley, blocks, jib crane, mobile crane, power crane, manually propelled stacker, guy derricks.

TOPIC -6

ERECTION OF FABRICATED STRUCTURE:- Advance

planning sequential despatch and transporting, erection, field operation procedure, receiving and unloading, sorting for erection, moving to the site, aligning, erecting and fastening.

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Erection equipment - stiffening derricks, guy derricks, specialized unit, erection tools and materials- manila ropes, wire rope, hoisting chains, slings.

TOPIC-7 SAFETY AND HAZARDS IN FABRICATION AND ERECTION:-

Identify unsafe acts and conditions in erection, precaution while working at height, safety rules to be followed while using crane, winches and pulley blocks, safety precautions for welding process preventive measures to avoid accidents such as fall, slip, slide etc.

Hazards in fabrication work like fire, noise, electric shock etc. safety appliances.

Reference to relevant T.S. Codes on safety.

First Aid Box for preliminary treatment.

TOPIC-8 COSTING OF FABRICATED STRUCTURE:- Measurement

and quantity of materials, component of costing material, labour and overhead charges cost control and analysis.

Rate Analysis for welding.

TOPIC-9 FIELD VISITS:- The students will visit the

site where fabrication work, erection work, and testing of welded joints by non-destructive testing is going on. The students will prepare the report of each visit. This will be treated as a part of laboratory work. Viva will be based on this report.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : FABRICATION AND ERECTION.
COURSE CODE : C - 601

LIST OF PRACTICALS/SKETCHES

1. Dimensioned detailed sketches of joints of steel beam with steel column, steel truss.
2. Preparing a simple welded joint (Fillet weld)
3. Exercise of erection with the help of pulley block.
4. Field visits:- visits may be arranged to a site where fabrication and erection work is in progress. During field visits, demonstration of testing of welded joints by non-destructive testing may be arranged.
5. Shifting heavy column or girder and raising and erecting without help of crane.
6. Mini Project :- A mini project may include fabrication of a door or window or steel truss and full proposal including materials required, costing and erecting may be made. The mini project should be useful for some practical purpose (To be used in polytechnic or outside).

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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : FABRICATION AND ERECTION.
COURSE CODE : C- 601

LIST OF REFERENCE BOOKS.

- | | |
|---|---|
| 1. Design of steel Structures | J.L. Sharma
Satya Prakash
New Delhi-110 003 |
| 2. Materials Handling Equipments | N.Rudenko
Envee Publisher
New Delhi |
| 3. Design of Steel Structures | Arya and Ajmani
Nemchand and Bros.
Borkee(U.P.) |
| 4. Hand book of Heavy Construction | Havers and Stubbs
McGraw Hills. |
| 5. Building Construction Handbook | Merritt P-5
Mc Graw Hills. |
| 6. Workshop Technology | Hajra Choudhary
(Asia Publication) |
| 7. Technician Fabrication and welding | Cooper K.J.Greenwood
(Cassel) |
| 8. Basic Fabrication and welding of
Engineer . . . | Smith F - J.M.
Longman |

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : RAILWAY AND TUNNEL ENGINEERING.
COURSE CODE : C- 602
PREREQUISITE : NIL

SCHEME OF STUDIES

HOURS/WEEK : THEORY (3) PRACTICAL (2) CREDIT : (4)

S.No.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Introduction	02	-	02
2.	Permanent way	04	-	04
3.	Railway Track	06	-	06
4.	Railway Fixtures and Fastenings	03	-	03
5.	Geometrics	06	-	06
6.	Points and Crossings	05	-	05
7.	Layouts of Stations and Yards.	04	-	04
8.	Signalling and Interlocking	05	-	05
9.	Modern Developments in Railways	04	-	04
10.	Tunnelling	06	-	06
11.	Underground Railways & Tunnelling.	03	-	03
12.	VISITS & REPORTS (Lab work)	-	32	32
TOTAL		48	32	80

SCHEME OF EXAMINATION

TW	SESSIONAL		PROGRESSIVE		BOARD EXAMINATION		PRACTICAL / VIVA		
	LW	I	II	PAPER	DURA.	MARKS	PRACT.	DURA.	MARKS
20	20	10	10	1	3	100	1	3	50

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : RAILWAY AND TUNNEL ENGINEERING
COURSE CODE : C- 602
PREREQUISITE : NIL.

COURSE CONTENTS

TOPIC NO.

1. INTRODUCTION :
Brief history of railways, Role of railways in transportation, its advantages, comparison of railway and highway transportation, Classification of Indian railways, Classification of railway lines based on speed criteria, Railway terminology.
2. PERMANENT WAY :
Permanent way and its components, Requirements of ideal permanent way, Gauges in railway track, Selection of gauges, Uniformity of gauges, Necessity of adopting different gauges, Demerits of adopting different gauges, Railway track crosssections, cross section in cutting, filling, single line double line Drainage in Railway tracks & Yards. coning of wheels.
3. RAILWAY TRACK :
Functions of Ballast, Requirement of good ballast, Different materials used as Ballast, Size and section of Ballast, Scissors method of packing Ballast, Renewal of Ballast and quantity required.
Functions of Sleepers, Requirements of good sleeper, Types of Sleepers, Their advantages and disadvantages, Comparison of wooden metal and concrete sleepers, spacing of sleepers and sleeper density, Adzing of sleepers, Bridge sleepers, Stacking of sleepers.
Functions of rails, requirement of rails, Types of rail sections, DH BH and FF rails, their standard nomenclature and comparison, Length of rails, wear of rails, their causes and remedial measures, Rail failures, Welding of rail joints, Purpose welding, Methods of welding and its advantages, Length of welded rails, Creep of rails, Indications of creep, Theories of creep, Effects of creep, Measurement of creep, prevention of creep.
4. RAIL FIXTURES AND FASTENINGS :
Purpose and types of fixtures and fastenings, Fishplates, Requirements, sections and failures of Fishplates. Spikes, Types, Uses, Characteristics of good spikes. Chairs for BH and DH Rails, cast iron chairs, slide chairs, Keys. Bearing plates, Saddle plates, Tie bars and cotter suspended rail joints and staggered joints.

5. GEOMETRICS :
Necessity of geometric design of a railway track, Degree of curve, gradient and grade compensation, Ruling gradient, Momentum gradient, pusher gradient, Gradient in station yards, Grade compensation on curves, Widening of gauge on curves, Extra clearance on curves, Superelevation or cant, objects of providing superelevation, Relationship between superelevation, gauge, speed and radius of curve, Average speed, Limits of superelevation, Cant deficiency Negative cant, Types of curves, Transition curves, Necessity of providing transition curves, Types and length of transition curves, curve indicator, Check rails, Purpose and necessity of providing check rails on curves.
6. POINTS AND CROSSINGS :
Necessity of points & crossings, Functions, Components of turnouts, Left hand turnout - Right hand turnout, working of turnout, points or switches, Type of switches, Crossing, Types of crossings, crossing number, Crossing used in Indian railways, Combination of points and crossings.
7. LAYOUTS OF STATIONS AND YARDS :
Definition, Functions of stations, Requirements of stations, Classification of stations, Junctions & terminals, plat form, Station yards, Classification of yards, Sidings, Level crossing.
8. SIGNALLING AND INTERLOCKING :
Objects, Engineering principles, Classification of signals, Requirements of signalling, Types of signals, control system, Interlocking, Principles of interlocking.
9. MODERN DEVELOPEMENTS IN RAILWAYS :
Introduction, Modernisation of tracks, speed trends, Container transport services, Unigaging, Traction and tractive resistance, Modern methods of track maintenance.
10. TUNNELING :
Necessity of tunnelling, Shape and size of tunnel, methods of tunnelling, ventilation, Drainage and lighting of tunnels.
11. UNDERGROUND RAILWAYS AND TUNNELLING :
Underground railways, Tunnelling method for underground railways, size and shape of railway tunnel, Future of underground railways.
12. VISITS & REPORT :
Student will prepare atleast 08 reports on visits to different maintenance and operations related to railway tracks during visits. The writeups for the reports should give the following information :-
 - (i) Objects of maintenance operations.
 - (ii) Materials required.
 - (iii) Tools and Plants needed.
 - (iv) Maintenance procedure.
 - (v) Precautions to be taken during operations.
 - (vi) Remedial measures to check/reduce the maintenance.

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TOPICS FOR VISITS & REPORTS :

1. Through packing.
2. Shovel packing.
3. Track maintenance.
4. Systematic overhauling.
5. Lifting of track.
6. Lowering of track.
7. Counteraction, measurement and adjustment of creep.
8. Organisationⁿ, Tools and equipments for maintenance.
9. Maintenance of points and crossings.
10. Maintenance of level crossing.
11. Maintenance of proper Drainage.
12. Maintenance of gauge.
13. Maintenance of track components.
14. Any other item suggested by Teacher guide.
15. Welding of Rails.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : RAILWAY AND TUNNEL ENGINEERING.
COURSE CODE : C- 602
PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS

S.No.	TITLE	AUTHOR	PUBLISHER
1.	Text book of Railway Engineering.	R.B. Deshpande	United book Corp. Poona.
2.	Railway Engineering.	N.K. Vaswani.	Roorkee publishing house.
3.	Text book of railway engineering.	R.C. Rangawala	Chatter publishing house, Anand(W.R.)
4.	Text book of railway engineering.	S.C. Saxena & S.P. Arora	Dhanpal Rai & sons.
5.	Indian railway track design, construction, maintenance and modernisation.	M.M. Agrawal	Manglik prakeshan 159, Bomani Road Saharanpur.
6.	Permanent way manual		Indian Railway Board.
7.	Modern Permanentway	M. Shrinivisan	Somaiya publication, Bombay.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

- PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
- COURSE : CONCRETE TECHNOLOGY.
- COURSE CODE : C- 603
- PREREQUISITE : NIL.

R A T I O N A L E

Concrete is by far the most widely used construction material today. The versatility and mouldability of this material, its high compressive strength and the discovery of the reinforcing and prestressing techniques which helped to make up for its low tensile strength have contributed largely to its widespread use. We can rightly say that we are in the concrete age.

It is easy to make concrete. There is an old saying that broken stone, sand and cement make good concrete. But the same proportion of broken stone, sand and cement also make bad concrete. This is mainly because the quality of the end product depends as much, and perhaps more, on the man on the job as on the constituent materials. The difference between good concrete and bad concrete lies in quality control. Still, not many men on the jobs seem to make use of the known techniques for making good concrete which is necessary for achieving strong, durable and economical construction.

At all the construction projects, it is mainly the diploma holder who supervises the various construction activities. particularly, during the concreting process, a diploma holder has the responsibility for controlling the qualities of the fresh and the hardened concrete.

Therefore, students doing diploma in civil engineering or in construction technology must understand the importance of the subject "concrete technology" and should study it properly.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPLAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : CONCRETE TECHNOLOGY
 COURSE CODE : C- 603
 PREREQUISITE : NIL.

SCHEME OF STUDIES

HOURS/WEEK : THEORY (3) PRACTICAL (2) CREDIT : (4)

S.No.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Introduction	02	-	02
2.	Cement	04	-	04
3.	Types of Cement	04	-	04
4.	Testing of Cement	04	08	12
5.	Aggregates & Testing of Aggregates	06	10	16
6.	Fresh Concrete	08	04	12
7.	Strength of Concrete	08	04	12
8.	Concrete Mix Design	12	06	18
TOTAL		48	32	80

SCHEME OF EXAMINATION

SESSIONAL	PROGRESSIVE		BOARD EXAMINATION		PRACTICAL/ VIVA		
	TW	LW	I	II	PAPER	DURA. MARKS	PRACT. DURA. MARKS.
20	20	10	10	1	3	100	1 3 50

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOJAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CONCRETE TECHNOLOGY
COURSE CODE : C- 603
PREREQUISITE : NIL.

COURSE CONTENTS

TOPIC NO.

1. INTRODUCTION : WHAT IS CONCRETE ? Ingredients and their functions, various mixes and grades. Various types and its uses.
2. CEMENT : Manufacture of Portland cement, Chemical composition Oxide composition limits of ordinary Portland Cement, Hydrated cement, water environment for hydration.
3. TYPES OF CEMENT : Ordinary Portland Cement, Rapid hardening Cement, Quick setting Cement, Low heat Cement, Portland pozzolane Cement, Coloured cement, High strength cement, High alumina cement, Sulphate resistant cement, chemical composition properties and uses of various types various additives & admixtures- uses and function.
4. TESTING OF CEMENT : Field testing and laboratory testing. Fineness test, Setting time test, Strength test, Soundness test, heat of hydration test.
5. AGGREGATES AND THEIR TESTING : Classification on the basis (i) Source (ii) Size (iii) Shape (iv) Texture, Strength of aggregates, aggregate impact value, aggregate abrasion value, Deval attrition test, Dorry abrasion test, Los Angeles test, Modulus of elasticity, Bulk density, Specific gravity, Absorption and moisture content, Bulking of aggregates, Measurement of moisture content of aggregates by (i) Drying Method (ii) Displacement Method. Cleanliness, Soundness of aggregates. Grading of aggregates, Sieve analysis, Specific surface and surface index, Standard grading curve.

Testing of aggregates (i) Flakiness index (ii) Elongation index (iii) Test for determination of clay, fine silt and fine dust (iv) Specific gravity test (v) Bulk density and voids (vi) Test for aggregate crushing value (vii) Ten percent fines value test (viii) aggregate impact value test. aggregate abrasion value test. Suitability of different aggregates for different concrete works.

- 6. FRESH CONCRETE : Workability, factors affecting workability, Measurement of workability by (i) s-lump test(ii)Compacting factor test (iii) Flow test (iv) Kelly ball test (v) Vee Bee consistometer test, Segregation and bleeding. Process of manufacture of concrete (i) Batching (ii) Mixing (iii) Transporting (iv) Placing (v) Compacting (vi) Curing (vii) finishing and detailed description. Form work and its removal safety precautions observed.
- 7. STRENGTH OF CONCRETE : Strength of concrete, water/cement ratio, Gel/Space ratio, Gain of strength with age, Maturity concept of concrete effect of maximum size of aggregates on strength, Relation between compressive and Tensile strength, Bond Strength, Aggregate cement bond strength, High strength concrete. Joints in concrete work- their position and types. Testing of concrete- Destructive & Non destructive. Related Indian standard Numbers and its contents for all ingredients of concrete.
- 8. CONCRETE MIX DESIGN :
 Concrete mix design, variables in Proportioning, methods of proportioning, Statistical quality control of concrete common terminologies (a) Mean Strength (b) Variance (c) Standard deviation (d) Coefficient of variation, Methods of Mix design (i) ACI Method (ii) Indian Standard Method.
 Special types of concrete.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

programme : DIPLOMA IN CIVIL ENGINEERING.
course : CONCRETE TECHNOLOGY
course code : C- 603
prerequisite : NIL.

LIST OF EXPERIMENTS.

1. Fineness test on cement by sieving.
2. Determination of initial setting time of cement.
3. Determination of final setting time of cement.
4. Soundness test on cement.
5. Test for determination of fineness index.
6. Test for determination of specific gravity.
7. Test for determination of bulk density and voids.
8. Test for determination of aggregates crushing value.
9. Test for determination of aggregate impact value.
10. Determination of workability by slump test.
11. Determination of compressive strength of concrete cubes.
12. Mix.Design of concrete by Indian Standard Method.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : CONCRETE TECHNOLOGY
COURSE CODE : C- 603
PREREQUISITE : NIL.

LIST OF REFERENCE BOOKS

S.No.	TITLE	AUTHOR	PUBLISHER
1.	Concrete Technology	M.S.Shetty	
2.	Concrete Technology	R.S. Varshney	
3.	Properties of Concrete	A.M. Neville	
4.	Concrete Technology	B.L. Gupta (Hindi)	
5.	Concrete Manual	Gambhir.	

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

DETAILED - CURRICULUM.

COURSE TITLE : ADVANCE BUILDING CONSTRUCTION TECHNOLOGY
COURSE CODE NO : C- 604
PREREQUISITE : NIL
CATEGORY : DIVERSIFIED

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM

DEVELOPED BY : STATE CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPL

IN COLLABORATION WITH : TECHNICAL TEACHERS TRAINING INSTITUTE,
BHOPL.

SPONSORED BY : DIRECTORATE OF TECHNICAL EDUCATION,
BHOPL

VISUE : SHRI VAISHNAV POLYTECHNIC,
INDORE.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : ADVANCE BUILDING CONSTRUCTION TECHNOLOGY
 COURSE CODE : C- 604
 PREREQUISITE : NIL.

SCHEME OF STUDIES

HOURS/WEEK : THEORY (3) PRACTICAL (2) CREDIT : (4)

S.NO.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Modern Construction equipments	06	03	09
2.	Modern construction chemicals.	04	02	06
3.	Modern Construction Materials	06	02	08
4.	Modern Exterior & Interior Treatments.	06	03	09
5.	Precast Components	05	02	07
6.	Multistoried Building & Commercial Complex	12	06	18
7.	Market Survey	03	06	09
8.	Study visits & field trips & report writing.	06	08	14
TOTAL		48	32	80

SCHEME OF EXAMINATION

TW	LW	PROGRESSIVE BOARD EXAMINATION		PRACTICAL/ VIVA					
		I	II	PAPER	MARKS				
20	20	10	10	1	3	100	1	3	50

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

- PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
- COURSE : ADVANCE BUILDING CONSTRUCTION TECHNOLOGY.
- COURSE CODE : C- 604
- PREREQUISITE : NIL.

R A T I O N A L E.

Development of new techniques in Civil Construction is the human tendency avail from the development of human civilization this trend is becoming more and more sophisticated use of equipments & new materials have changed the entire scene. Now a days high rise building construction of commercial & residential complexes is a very common technique.

Use of construction chemicals, equipment have changed towards more modernisation in Civil construction industry, various conventional methods are becoming obsolete as new materials are to be used with new methods.

The aim of this subject is to make student aware with the latest trends in the construction activities, so that he can be easily accommodated in the field immediately after passing his diploma or can join the other activities like marketing, specialised servicing like water proofing treatment services exterior & interior development services, precast concrete components manufacturer bussiness etc.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : ADVANCE BUILDING CONSTRUCTION TECHNOLOGY.
COURSE CODE : C- 604
PREREQUISITE : 502 & 503

COURSE CONTENTS

TOPIC NO.

1. MODERN CONSTRUCTION EQUIPMENTS :
Equipments used in excavation, trench digging, loading, transportation, concrete mixers, Batching plant, various types of material elevators, various types of vibrators & compactors suitability of various equipments along with advantages, limitations.
2. MODERN CONSTRUCTION CHEMICALS :
Various construction chemicals used in construction industry like water proofing treatment, Epoxy treatments, leakage sealant materials, concrete setting lime accelerators retarders, concrete bonding chemicals, chemicals to increase workability.
3. MODERN CONSTRUCTION MATERIALS:
Various types of new materials used in building like PVC doors & windows, frames, aluminium structures, ply & non wood boards PVC water supply & drainage systems, uses of HDPE tanks in water supply systems, use of PVC fixtures in bathrooms use of these new materials in wall cladding & furniture making suitability of these new materials with the situations. Procedure of using these materials.
Modern flooring materials.
4. MODERN EXTERIOR & INTERIOR TREATMENTS :
Various treatments used in exterior treatments of building like stone cladding, marble granite cladding, exterior wall painting treatments. Various treatments used in interior of building application of various types of synthetic based paints, partitioning false roofing.
5. PRECAST COMPONENTS :
Use of precast concrete members in the building industry. Their advantages & limitation. Various building components which can be prepared under precast system & their suitability.

6. MULTISTORIED BUILDINGS & COMMERCIAL COMPLEX :

study of layout drawings at various stages, procedure of layout, study of working drawings & structural drawings, construction procedure of high rise building. List of various amenities to be provided in the commercial complex like elevators, escalators, parking space, water supply & sanitary systems. Fire Fighting provisions:

- . General concept about wiring systems
- MCB's
- Diff building codes and statutory requirements.

7. MARKET SURVEY :

Student will carryout market survey at various stages of study & will collect latest information about new materials and observe the working with new materials during their construction visits.

LIST OF PRACTICALS

STUDY VISITS, FIELD TRIPS :

Students will go to the various work sites to study the various process, will conduct market survey to collect the informations about various new materials available, will collect working drawings multistoried & commercial buildings and study the different aspects, will prepare layout plans from the drawings, prepare structural drawings for a buildings and prepare a REPORT of their study and submit it at the end of the semester.

Practical examination will be held on the basis of the report submitted.

DETAILED - CURRICULUM.

COURSE TITLE : MAINTENANCE ENGINEERING.
COURSE CODE : C- 605
PREREQUISITE : NIL.
CATEGORY : DIVERSIFIED

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING
UNDER
MULTI POINT ENTRY AND CREDIT SYSTEM

DEVELOPED BY : STATE CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL

IN COLLABORATION WITH : TECHNICAL TEACHERS TRAINING INSTITUTE,
BHOPAL

SPONSORED BY : DIRECTORATE OF TECHNICAL EDUCATION,
BHOPAL.

VAUE : SHRI VAISHNAV POLYTECHNIC,
INDORE.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOVAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
 COURSE : MAINTENANCE ENGINEERING.
 COURSE CODE : C- 605
 PREREQUISITE : NIL.

SCHEME OF STUDIES

HOURS/WEEK : THEORY (3) PRACTICAL (2) CREDITS: (4)

S.NO.	TOPIC	HOURS		
		Theory	Practical	Total
1.	Introduction	02	-	02
2.	Earth work Maintenance	04	02	06
3.	Masonry work Maintenance	03	04	07
4.	Concrete & RCC work Maintenance	03	04	07
5.	Steel work Maintenance	02	02	04
6.	Wood work Maintenance	02	02	04
7.	Buildings Maintenance	08	04	12
8.	Canal Maintenance	02	02	04
9.	Road Maintenance	05	04	09
10.	Bridge & Culvert Maintenance	05	02	07
11.	Water Supply Distribution & Sewer Maintenance	06	04	10
12.	Railway Track Maintenance	03	02	05
13.	Safety in Maintenance	03	-	03
TOTAL		48	32	80

SCHEME OF EXAMINATION

TW	SESSIONAL		PROGRESSIVE		BOARD EXAMINATION		PRACTICAL/ VIVA		
	LW	I	II	PAPER	DURA. MARKS	PRACT. DURA. MARKS	PRACT. DURA. MARKS		
20	20	10	10	1	3	100	1	3	50

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : MAINTENANCE ENGINEERING.
COURSE CODE : C- 605
PREREQUISITE : NIL.

RATIONALE

It is a general practice to entrust the job of maintenance work to fresh pass outs in the departments so as to enable them to make understand the procedure of works and get some experience to handle the labour. They are required to do the day to day maintenance work for Roads, Culverts, bridges, Canals, Buildings & railway tracks etc. Maintenance for different works and structure have common features and principles. If they are acquainted with basic principles of maintenance in college, then they can develop the skill and attitude towards the maintenance jobs which they will have to carry out in departments.

An attempt is being made to teach the general principles of maintenance techniques and special maintenance jobs are not included. Once they are acquainted with basic principles and handle some regular maintenance jobs, the skill to handle the special maintenance job will be developed by actual field practice & experience.

In the practical periods group of 3 to 4 students should be awarded to study a specific job of maintenance in various civil engg. subjects which are being carried over by state govt. deptt. like P.W.D., Irrigation, Highways, Local bodies like Municipal Corporation or Central Deptt. like Railways etc. It is better if they are placed on a specific job for a week or so alongwith teachers.

Case studies will be an effective method for teaching the subject. The cases should be included with all relevant sketches and be prepared or adopted to achieve specific learning outcomes.

(Note:- It will be better if the maintenance of each subject is taught alongwith the subject by concern teacher as it is very difficult to teach all subjects by one teacher, and good text books are not available more over it being a practical subject it is difficult to get good teacher in every Institute having practical knowledge.

9. ROAD MAINTENANCE :

Road surface maintenance, & profile maintenance drainage system maintenance, sub soil water movements traffic signal , boards, tree guards etc. repairing of parapets culverts bridges.

10. BRIDGE & CULVERT MAINTENANCE :

Maintenance Bridge Inspection registers, inspection of foundation, sub structure, super structure cracks in the walls bridge bearings, adequacy of water way etc. pre monsoon inspection. & periodic maintenance & repair.

11. WATER SUPPLY DISTRIBUTION & SEWER MAINTENANCE :

- a. Causes of loss of water pressure, leakage in lines, methods of leak detecting, causes of wastage of water, methods of improving pressure in the line.
- b. Inspection of sewers, cleaning & flushing, cleaning of catch drains, repairing/replacing of broken sewers, cleaning & maintenance of chambers & septic tank, man holes & sewer.

12. RAILWAY TRACK MAINTENANCE :

Surface, routine maintenance of permanent way, blowing points, creep, tools used in maintenance.

13. SAFETY IN MAINTENANCE :

Accidents, common causes of accidents, precautions to be taken during maintenance works of various natures, points to be observed while working with Electrical & Mechanical devices.

LIST OF CASE STUDIES

1. MASONRY WORK MAINTENANCE :
Case studies by visit to different sites in P.W.D. & local bodies departments.
2. CONCRETE & RCC WORK MAINTENANCE :
Case studies by visit to different sites of Govt. Deptt. works & multistoreyed buildings in nearby areas.
3. STEEL WORK MAINTENANCE :
By visit to factory sites of Industrial Departments.
4. WOOD WORK MAINTENANCE :
By visit to carpentry & furniture shops & forest deptts. wood depots.
5. BUILDING MAINTENANCE :
By visit to old important building in nearby areas & building of archaeological deptts.
6. CANAL MAINTENANCE :
By visit to Irrigation Deptt. during routine maint. work of pre-monsoon & post monsoon.
7. ROAD MAINTENANCE :
By visit to national highway & state highways during routine maintenance work.
8. BRIDGE & CULVERT MAINTENANCE :
By visit to important bridge in nearby areas during pre & post monsoon maint. work.
9. WATER SUPPLY DISTRIBUTION & SEWER MAINTENANCE :
By visit to PHE deptt. & Municipal Corporation during their periodical maint. work.
10. RAILWAY TRACK MAINTENANCE :
By visit during the routine maint. work of Indian Railways in nearby areas.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

DETAILED - CURRICULUM.

COURSE TITLE : ADVANCED ENVIRONMENTAL ENGINEERING.
COURSE CODE NO : C/CTM - 606
PREREQUISITE : 302
CATEGORY : DIVERSIFIED COURSE

DIPLOMA PROGRAMME IN
CONSTRUCTION TECHNOLOGY & MANAGEMENT
(UNDER MULTI POINT ENTRY AND CREDIT SYSTEM)

DEVELOPED BY : STATE CURRICULUM DEVELOPMENT CENTRE
M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL

SPONSORED BY : DIRECTORATE OF TECHNICAL EDUCATION, BHOPAL.

The curriculum of the course "Advanced Environmental Engineering" was developed in a workshop organised by state curriculum development centre at the Govt. Polytechnic, Ujjain from 27.3.95 to 31.03.95.

The curriculum includes objectives at knowledge: comprehension and application levels. So that a proper understanding of the concepts, Principles rules and relationships can be effectively imparted to the students.

Comments and healthy suggestions from faculty members are however welcomed so that if required the prepared curriculum can be reviewed and revised periodically.

We are highly grateful to the Director of Technical Education Madhya Pradesh Bhopal, for the valuable guidance encouragement and active co-operation in the curriculum development work.

Thanks to the Principal and staff of Govt. Polytechnic Ujjain for getting the workshop arranged and taking active part in preparing the curriculum.

We always aspire to improve this.

Secretary,
M.P. Board of Technical Education,
Bhopal.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPL.

DETAILED - CURRICULUM.

COURSE TITLE : ADVANCED ENVIRONMENTAL ENGINEERING.
COURSE CODE NO : CEM- 606
PREREQUISITE : 302
CATEGORY : DIVERSIFIED COURSE

Workshop Group

Course Curriculum → S.K.Jain, Principal
Convener Govt. Polytechnic Ujjain.
Co-ordinator → S.B.Kale I/c HOD (Civil Engg.)
Govt. Poly. Ujjain.
Organising Secretary - Rajesh Sharma, Lecturer in Civil Engg.
Govt. Poly. Ujjain.

Experts

1. Prof.(Dr.) R.C.Jain - Mechanical Engineering Department
Ph.D Government Engineering College,Ujjain.
2. Prof.(Dr.) K.S.Rao - Zoology Department
Ph.D School of Studies
Vikram University, Ujjain.
3. Prof.(Dr.) M.T.Datar - Head of Civil Engineering Department
Ph.D (P.G.Course) Govt. Engg. College,Ujjain.
4. Mr. V.K.Ishirwar - Executive Engineer
(M.E. Envi. Engg.) M.P.Pollution Control Board,Ujjain
Division

PARTICIPANTS

1. Er.Rajesh Sharma
(M.E.Env.Engg. & Pollution Control) Lecturer (civil),Govt.Polytechnic,Ujjain.
2. Er.R.C.Tiwari
(M.E.Env.Engg.& Pollution Control) Lecturer (civil),Govt.Polytechnic,Ujjain.
3. Er. S.B.Kale
(M.E.Env. Engg. & Pollution Control) Lecturer (civil),Govt.Polytechnic,Ujjain.
4. Er. R.C.Gupta,
(M.E.Env. Engg. & Pollution Control) Lecturer (civil),Govt.Polytechnic,Ujjain.
5. Er. M.S.Thakur.
B.E.(Mech.Engg.) HOD Mechanical Engineering Department,
Government Polytechnic, Ujjain.
6. Mr. S.P.K. Rao
Research Officer,CDC,M.P.Board of
Technical Education Bhopal.
(Board's Representative).

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CONSTRUCTION TECHNOLOGY & MANAGEMENT.
COURSE : ADVANCED ENVIRONMENTAL ENGINEERING.
COURSE CODE NO : CTM- 606
PREREQUISITE : 302

R A T I O N A L E.

A diploma in construction technology and management programme is started under Multi Point entry and Credit system. The inclusion of various courses (subjects) in this programme are made in such a way to make a technician a perfect one.

The course of Advanced Environmental Engg. is introduced as one of the diversified courses and aims at developing grasp on effective environment protection during civil engineering projects. execution.

SCHEME OF STUDIES

	Theory	Practical	Total
SEC-1 Introduction	09	-	09
SEC-2 Environmental Microbiology	04	04	08
SEC-3 ENVIRONMENTAL Chemistry	04	04	08
SEC-4 Wastewater Characteristics	03	12	15
SEC-5 Wastewater treatment processes	16	06	22
SEC-6 Biological Treatment	12	06	18

TOTAL:	48	32	80

Approved with following remarks & corrections:-

REMARKS :

The committee feels that -

The time allotted is too less due to the contents hence the expert committee should either reduce the contents or increase the time.

This subject is new one. Hence the government should make necessary arrangement for training of teacher.

Laboratory facilities should made available before starting this subject.

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SCHEME OF EXAMINATION

Course and course code	Hours per week	Or Sessional	Progressive assessment	Board paper	Duration hours	Theory marks	Practical/ Lab. Marks	Total marks	Hours		
Advanced Environmental Engineering CEM-606	03	02	04	20	10	100	33	01	03	50	20

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TOPIC I INTRODUCTION :
Review, Environment definition, Pollution, Solid waste
Impact of Thermal Power plant, Water Pollution,
Oxygen sag curve.

TOPIC II ENVIRONMENTAL MICROBIOLOGY :
Importance of microbes, Classification of Microbes,
Role of enzymes

TOPIC III ENVIRONMENTAL CHEMISTRY :
Oxidation-Reduction, Importance of pH, Significance of
acidity and alkalinity, Dissolved oxygen, BOD, COD, :
Significance of solids present in wastewater.

TOPIC IV WASTEWATER CHARACTERISTICS :
Domestic and Industrial wastewater, Industrial sewage,
IS code standards, Importance of wastewater characte-
-rization, Wastewater survey.

TOPIC V WASTEWATER TREATMENT PROCESS :
Need of wastewater treatment, Elements of wastewater,
Treatment units flow diagrams with efficiency for Dome-
-stic and Industrial wastewater, Aims and objects of
secondary treatment, Objects of Industrial wastewater
treatment, Units of primary treatment, Grit, Skimming
tank, Detritus tank, Coarsen particles, aims of
sedimentation, Biological Oxidation reduction,
Oxidation pond.

TOPIC VI BIOLOGICAL TREATMENT UNITS :
Necessity of Biological treatment, Bio-oxidation-Bio-
reduction, Attached growth system, suspended growth
system : aerobic treatment, Anaerobic treatment, few
field problems.

4/11/44

REFERENCES

AIR POLLUTION : M.H. Rao
(Tata McGraw Hill)

WASTEWATER TREATMENT AND DISPOSAL : Soli J. Arcivale
(Morccc Dekker Inc. U.S.A.)

WASTEWATER TREATMENT FOR POLLUTION : Soli J. Arcivale
CONTROL.
(Tata McGraw Hill)

WATER SUPPLY AND SEWERAGE : E.W. Steel and Terence
(Tata McGraw Hill) J McGhee

WASTEWATER ENGINEERING TREATMENT : Mectalf & .. Eddy Inc.
AND DISPOSAL. Revised by
(Tata McGraw Hill) George Rhobanoglous

INDUSTRIAL WATER POLLUTION : : W.Wesley Eckenfelder
CONTROL. Jr.

INDUSTRIAL WASTE TREATMENT : IITRI Nagpur.
(Central public health &
Environmental engineering
Organisation New Delhi)

INTRODUCTORY ENVIRONMENTAL : Dilip Kumar Markandey
POLLUTION & CONTROL. Nilima Rajvaidya.
(Hindi edition) (Standard
Publishers distributors Delhi)

ENVIRONMENTAL CHEMISTRY : Swayer - Mcarty

ELEMENTS OF MICROBIOLOGY : Michael J. Pelczar
Jr./E.C.S. Chan.

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S.No.	General Objective/ Specific Objective	Content
1.1	REVIEW	
1.1.1	Define Environment as The four major elements land, water, air and living organism plants and animals together constitute what is known as Environment or Ecosystem.	
1.1.2	Classify environment as (i) physical environment (ii) Biological environment.	Land, water and air together infect forms one group of environment called physical environment. Living organism form another group of environment termed as biological environment.
1.2	Describe following as related to environment. - Biosphere - Lithosphere - Atmosphere	It is the depth 1000m below sea level and 6000m above sea level where living organism exist. It is solid earth and its water collection is termed as hydrosphere. Gaseous layers surrounding upto the 700Kms distance from earth surface.
1.3	UNDERSTAND POLLUTION	
1.3.1	Define pollution as Any element which causes hazard in health, wealth of living being is termed as pollution	
1.3.2	Classify pollution as (i) Air pollution (ii) Pollution caused by solid waste (iii) Thermal power plant pollution and impact of Industrial pollution generation point. (iv) Noise pollution (v) Water pollution	

1.4 UNDERSTAND SOLID WASTE

1.4.1 Explain solid waste as according to WHO all non liquid waste materials arising from domestic, trade, commercial, industrial, agricultural and mining activities and from public services.

1.4.2 Narrate the constituents of Domestic solid waste

- Vegetable/putrescible matter 20% to 75%
- Inert matter 5% to 40%
- paper 2% to 60%
- Glass 0% to 15%
- Metals 0% to 15%

1.4.3 Classified domestic solid waste within the following parameters

Because these are the parameters which vary from place to place.

- (i) Weight generated
- (ii) Density
- (iii) Constituents

The range of weight generated/person/day usually lies between 250 to 1000gm worldwide.

Density varies from 100kg/cum to 600 kg/ Cu.m.

Volume may range between 1/2 Litre and 10 litres/person/day.

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1.4.4 Explain problems caused by solid waste in environment.

- Rainfall masts surface water course and creates trouble.
- While decomposition under anaerobic condition takes place, chances of epidemic are high if proper control and watch is not kept.
- Chances of flies nuisance are high.
- Contamination chances of sub-surface water are high
- Odour nuisance due to decomposition under anaerobic condition (caused by SO_2, CH_4, CO_2, H_2S production)

1.5 Explain Environmental Impact of plants.

- For generation of electricity while fuel is used. (fossil fuel coal or fuel oil) they release very heavy amount of pollutants like SO_2, CO, CO_2, POX , Fly ash, and cause primary and secondary pollution in environment. Cause smog formation, rise in temperature of surrounding area.
- Fly ash spread upto 3 to 6 km from the point of generation in normal course.
- The fall out rate of fly ash at Korba thermal power plant is about 300-500 t/km²/month near Korba
130-550 t/km²/month at 2.5 Km distance from Korba
60-450 t/km²/month at 4 Km distance from Korba.
- Cause trouble in breathing, reduce visibility, reduce fertility of land.

- 1.6.1 UNDERSTAND WATER POLLUTION
 Explain water pollution as "water which is not fit for domestic use termed as polluted water and is caused mainly by
 - Domestic use
 - Industrial use.
- 1.6.2 Differentiate Domestic and Industrial Wastewater according to pollution potential under following parameters
 (i) Physical
 (ii) Chemical
 (iii) Biological
- 1.6.3 Explain the methods of disposal of Wastewater.
 (i) Inland disposal
 (ii) In sewer
 (iii) In natural water course
- 1.6.4 Understand the various factors helping in self purification of stream.
 The factors are
 (i) Dilution
 (ii) Sedimentation.
 (iii) Sun Light
 (iv) Oxidation
 (v) Reduction
 (vi) Temperature
 (vii) Bacteria
- 1.6.5. Explain zone of pollution D.O. Profile
 - Zone of degradation
 - Zone of active decomposition
 - Zone of recovery
 - Zone of clear water

1.7 Explain Oxygen sag curve with the help of Deoxygenation, Reoxygenation and Oxygen sag.

Zone of pollution & DO profile

In Flowing water/Lotic system

In Standing water/Lentic system

- Inorganic pollution
- Organic pollutants
- Zone of damage
- Zone of recovery/self purification
- O₂ sag curve
- Hypolimnic quality of water
- Metalimnic quality of water
- Epilimnic quality of water

Surface aerator
 Aeration by photosynthesis/
 super oxygenation
 Oxygen extraction
 Anaerobic hypolimnion and
 Anaerobic metabolism.

Pollution Monitoring

- Organic Pollution
 broad estimation only
 species density indices
 spirobian system
 indicator organisms Bungi &
 Inorganic Pollution ^{indicator}
 both broad and elaborate
 accurate estimation
 involving extended
 methodology and expenditure
 aeration
- Cooling channels
- Effluent recirculation
- Effluent flow
- Effluent treatment
- Effluent analysis
 contaminant recovery
- Effluent treatment
 technology
 Estimation & removal of
 Heavy Metal Contaminants
 Estimation & removal of
 Pesticide & Agro chemical
 contaminants
 Estimation & removal of
 Industrial Inorganic
 Contaminants
 Pulp & paper waste
 effluents
 Distillery wastes
 Bioassay studies to assess
 Pollution potential.
- Effluent Treatment Plant.

TOPIC 2 - ENVIRONMENTAL MICROBIOLOGY

S.No.	General Objective/ Specific Objective	Content
2.1	UNDERSTAND THE IMPORTANCE OF MICROBES IN OUR ENVIRONMENT	
2.1.1	Define Microbes	
2.1.2	Explain important functions of the microbes	<ul style="list-style-type: none"> a) They help in maintaining balance of oxygen and carbon dioxide in atmosphere b) They help in maintaining continuous supply of nutrients in soil for plants c) They help in purifying Environment. They convert all waste into their original composition and ultimately into the form of soil.
2.1.3	List the various disadvantages caused to Human life due to microbes	<ul style="list-style-type: none"> a) Infections are caused due to microbes <ul style="list-style-type: none"> i) Pneumonia - Caused by Diplococcus Pneumoni ii) Diphtheria - Micro bacterium Diphtheri iii) Tuberculosis - Tuberculosis iv) Leprosy - Lepry v) Cholera - Vibria Cho-lera vi) Tetanus - Clostridium titem b) Food poisoning c) Food Spoiling - Salmonid group is specially responsible for this.

4/15/1

- 2.2 Classification of microbes on the basis of
 - a) Category
 - b) DNA
 - c) Source of carbon
 - d) Oxygen demand
 - e) Temperature variation

2.2.1 Category basis classification

Category	Representative member
a) Animals	- Rotifers Crustaceans etc.
b) Plants	- Mosses, Ferns
c) Protista-	(i) Higher protista algae, protozoa, fungi.
	(ii) Lower protista blue green algae, bacteria.

2.2.2 DNA basis classification

- d) Virus
- a) Eucaryotae : The DNA is enclosed by a membrane & the nucleus is clearly distinguishable eg. protozoa
- b) The DNA is not enclosed by a membrane & the nucleus is not clearly defined eg. Bacteria.

2.2.3 According to source of carbon

- i) Hetero trophic
 - a) Parasite
 - b) Saprophyte
 They derive carbon from living or dead organic matter.
- ii) Autotrophic microbes
 - a) Photosynthetic
 - b) Chemosynthetic
 These derive carbon from inorganic source, mainly carbon dioxide.

2.2.4 According to Oxygen demand

- i) Aerobic
- ii) Anaerobic
- iii) Facultative aerobic
- iv) Facultative anaerobic

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2.2.5 According to temperature variation

	Range	Optimum
i) Cryophilic (Psychrophilic)	-2 to 30	c 12 -18 c
ii) Mesophilic	20 -45	c 25 -40 c
iii) Thermophilic	45 -75	c 55 -65 c

2.2.6 According to shape and size

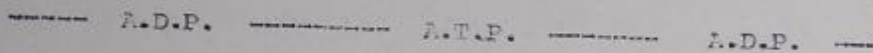
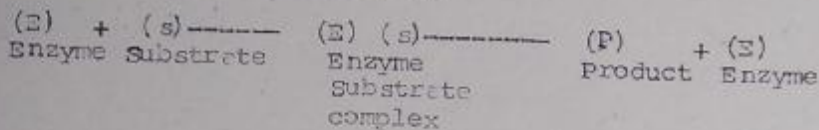
- i) Spherical
- ii) Rod Shaped
- iii) Spiral

Slides may be demonstrated in laboratory.

2.3 UNDERSTAND ROLL OF 'ENZYME' IN MICROBIAL METABOLISM.

2.3.1 Define the term 'Enzyme'

2.3.2 Express enzyme reactions as



2.3.3 UNDERSTAND DISTINCTIVE CHARACTERISTICS OF FOLLOWING MICROBES OF IMPORTANT ENVIRONMENTAL ACTIVITIES

- i) Take the students to the Laboratory to show the process of cultivation of bacteria.
- ii) Slides should be shown to identify the various microbes

- i) Bacteria
- ii) Algae
- iii) Protozoa.

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S.No.	General Objective/ Specific Objective	Content								
3.1	UNDERSTAND MEANING OF THE TERMS 'OXIDATION' AND 'REDUCTION'									
3.1.1	Define oxidation as a chemical reaction in which a substance gains oxygen or electronegative radical or loses hydrogen or an electropositive radical.	<p>Example</p> <p>(i) $S + O_2 = SO_2$</p> <p>(ii) $2FeSO_4 + H_2SO_4 = Fe_2(SO_4)_3 + H_2O$ gain of electronegative radical</p> <p>(iii) $H_2S + BR_2 = 2HBR + S$</p> <p>(iv) $2KI + H_2O_2 = 2KOH + I_2$</p>								
3.1.2	Define reduction as a chemical reaction in which a substance gains hydrogen or any electropositive radical or loses oxygen or electronegative radical.	<p>Example</p> <p>(i) $Cl_2 + H_2S = 2HCl + S$</p> <p>(ii) $SnCl_2 + 2HgCl_2 = Hg_2Cl_2 + SnCl_4$</p> <p>(iii) $CuO + H_2 = Cu + H_2O$ Loss of oxygen</p> <p>(iv) $Fe_2(SO_4)_3 + 2H = 2FeSO_4 + H_2SO_4$ (Loss of electronegative radical)</p>								
3.1.3	Explains that oxidation & reduction always go hand in hand, when one substance is oxidised, it is at the expense of the other which is reduced.									
3.2	UNDERSTAND THE IMPORTANCE OF PH IN WASTE WATER TREATMENT									
3.2.1	Define pH (with the help of law of mass action)									
3.2.2	Explain pH scale	<p>Acid condition increases as pH value decreases, and alkaline condition increases as pH value increases. pH 7 represents absolute neutrality.</p>								
	<table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Acid Range</td> <td style="text-align: center;">Basic range</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">14</td> </tr> <tr> <td colspan="2" style="text-align: center;">-----</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">14</td> </tr> </table>	Acid Range	Basic range	0	14	-----		7	14	
Acid Range	Basic range									
0	14									

7	14									

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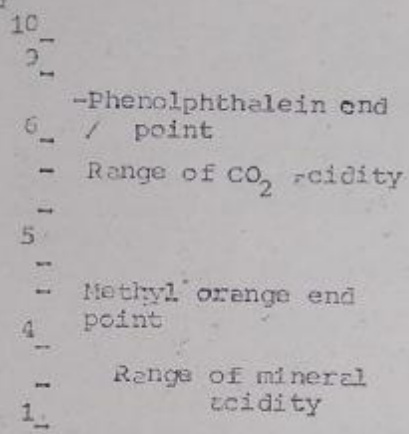
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- 3.2.3 Measure pH value by
 - (a) pH meter
 - (b) Colour indicator

- pH meter employs glass electrodes
- A wide variety of indicator are available to determine colour characteristics at various pH levels
- Demonstrate measurement of pH by both methods in laboratory.

3.3 UNDERSTAND SIGNIFICANCE OF 'ACIDITY' AND 'ALKALINITY' IN WASTEWATER TREATMENT.

- 3.3.1 State the effects of factors of acidity.
- 3.3.2 (i) Mineral acidity or methyl orange acidity
 - (ii) Carbon dioxide acidity



Mineral acids are measured by titration to a pH of about 4.5 methyl orange is used as indicator, hence called methyl orange acidity.

Phenolphthalein is used to determine total acidity due to mineral & due to weak acids, hence total acidity is termed as Phenolphthalein acidity.

3.4. Define alkalinity

Alkalinity of water is measure of its capacity to neutralize acids.

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3.5 state the effects of various factors of alkalinity
Chemical Coagulation
Water softening
corrosion control

Alkalinity as well as pH is an important factor in determining the availability of Wastewater to biological treatment
Demonstrate measurement of acidity and alkalinity in a sample in laboratory.

3.6 UNDERSTAND SIGNIFICANCE OF 'DISSOLVED OXYGEN' IN WATER/WASTEWATER

3.6.1 Explain the significance of 'DO' Determination

D O measurement are vital for maintaining aerobic condition in natural water that receives pollutional matter.
D O measurement are needed for aerobic treatment process of Domestic and Industrial waste water.
D O measurement is the basis of BOD test.

3.6.2 Know the influence of Temperature on D O

3.6.3 Measure D O by
a) Winkler method with Azide modification
b) D O electrodes

Demonstrate D.O determination by both methods in laboratory

3.7 UNDERSTAND TERM B.O.D.

Biochemical oxygen demand (BOD) is defined as amount of oxygen required by bacteria while stabilizing decomposable organic matter under aerobic condition.

3.7.1 Define following terms
(i) BOD
(ii) BOD₅
(iii) Ultimate BOD and BOD remaining.

3.7.2 Know the various methods of measuring BOD

Demonstrate dilution method for measurement of BOD₅ in laboratory

3.7.3 KNOW THE IMPORTANCE OF BOD DATA

- To determine strength of water and wastewater in terms of oxygen required for stabilization
- In stream pollution control where organic loading must be restricted to maintain desired DO level
- To keep check on effluents discharged from industries to natural waters.
- In the choice of treatment methods.
- In design of treatment units.

3.8 UNDER STAND TERM COD

3.8.1 DEFINE COD

During determination of COD, organic matter is converted to CO₂ & H₂O regardless of biological assimilability of the substances. Hence COD values are greater than BOD values.

3.8.2 Measure COD

- Demonstrate the methods of measurement of COD in laboratory
- The major advantage of COD test is the short time required for evaluation. (3 hrs rather than 5 days required for BOD test)

3.8.3 Know the significance of BOD /COD ratio

3.9 UNDERSTAND SIGNIFICANCE OF SOLIDS PRESENT IN WASTEWATER

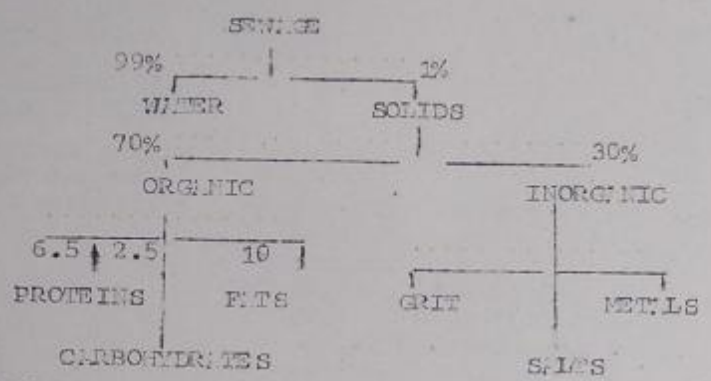
- 3.9.1 Defines terms
- (i) Dissolved solids
 - (ii) Suspended solids
 - (iii) Fixed solids
 - (iv) Volatile solids

Demonstrate the methods of determining DS, SS, FS & VS in a given sample of Wastewater.

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S.No.	General Objective/ Specific Objective	Content
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- 4.1 DIFFERENTIATE DOMESTIC & INDUSTRIAL WASTEWATER
- 4.1.1 Define sewage as
 Sewage is the Wastewater of a community. It may be purely domestic in origin or it may contain some industrial or agricultural Wastewater as well.
- 4.1.2 States the composition of Domestic sewage.



- 4.1.3 Compare the average characteristics of Domestic sewage and Industrial sewage from the following important Industries.
- Industrial waste is many times 'STRONGER' than Domestic Waste.
 Strength is often judged by BOD₅ or COD

	pH	BOD	COD	Total Solids	volatile Solids.
a) Textile					
b) Sugar					
c) Paper & pulp					
d) Dairy					
e) Distillery					
f) Domestic sewage					

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- 4.2 UNDERSTAND THE NECESSITY OF TREATING INDUSTRIAL SEWAGE
Domestic or Industrial wastes ultimately find their way to streams, soil or air, which are also the only sources for obtaining drinking water.
- 4.3 UNDERSTAND IMPORTANCE OF EFFLUENT STANDARDS PRESCRIBED BY IS CODE AS WELL AS POLLUTION CONTROL BOARD.
Norms from IS code and pollution Control Board may be given.
- 4.3.1 State Effluent standard prescribed by IS code for disposal of Industrial wastewater.
Maximum limits are fixed by IS code to Control Pollution of natural bodies, and soil.
 - (a) into natural streams
 - (b) on land
 - (c) into public sewers.
- 4.4 STATE THE IMPORTANCE OF WASTEWATER CHARACTERISATION
- 4.4.1 Know the procedure of quantitative analysis for Industrial Wastewater.
 - a) Identify wastewater generation points in Industry.
 - b) Monitor wastewater flow by V-notch or other suitable method for a fixed period.
 - c) Preparation of graph showing variation in wastewater flow.
- 4.4.2 Interpret the relevance of various treatment units of E.T.P.
In fixing the size of various treatment units of effluent Treatment plant.
- 4.4.3 Know the procedure of Qualitative analysis for Industrial wastewater.
The parameters to be selected depend on type of Industry.
- 4.4.4 Interpret the relevant data for various treatment units of E.T.P.
In designing various units of WTP
In studying the performance of each unit of treatment plant.

- 5. know the sampling techniques used in a wastewater survey for
 - (i) Representative sample
 - (ii) Grab sample
 - (iii) Composite sample

It should be ascertained to obtain representative samples External temperature of sample container must be kept always less than 40°c and appropriate preserver is added to prevent from change in characteristics.
- 5.1 Ascertain proper sampling location for a known sample technique.

To determine sampling location, examine the drawing that shows various process units and location of sewers manholes or open channels that carries wastewater.
- 5.2 Know the sampling interval for various flows of effluents w.r.t. its quantity and quality.

The degree of flow rate variation dictates the time interval for sampling.
- 5.3 Know the various sampling equipments.
- 5.4 Know the procedure of sample preservation.

Prompt analysis is the most positive assurance against error due to sample deterioration.

TOPIC - 5 WASTEWATER TREATMENT PROCESS

S.No.	General Objective/ Specific Objective	Content
5.1	Know the necessity of wastewater treatment .	<ul style="list-style-type: none">- To prevent the subsurface water from contamination.- To prevent aquatic life- To maintain minimum level of D.O. to protect from formation of anaerobic condition.- To protect from toxic matter assimilation in surface and subsurface water source.- To reduce organic load thus reducing microbial activities.

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- 5.2 Write the elements of wastewater as
- Coarse heavy solids - as sand gravel
 - Coarse floating matter - as pieces of wool, coal, rags, cork, oil & grease etc.
 - settlable suspended solids, - as all colloidal particles of organic and inorganic nature.
 - solids & solution
 - very fine suspended solids - as finer than colloidal size of inorganic nature.

5.3 Explains domestic wastewater treatment with flow diagram & efficiency of each unit.

Flow diagram








Preliminary -- Primary -- Secondary -- Tertiary

Unit	Screen	Grit chamber	Primary settling tank	Trickling filter or activated sludge process	Secondary tank	Chlorine tanks.
Object to remove	To remove big floating & suspended solids	To remove suspended & inorganic matter	To remove suspended organic and inorganic matter	To remove dissolved organic matter (colloidal matter)	To remove organic and inorganic suspended solids	To remove organic and inorganic suspended solids
By product	Screening dried and disposal	Grit/sand dried and disposal	Sludge contains organic matter further treatment	Sludge contains organic matter (biomass) further treatment	Sludge contains organic matter (biomass) further treatment	Sludge contains organic matter (biomass) further treatment
Efficiency	95-100% removal	90-95% removal	60-70% removal	95-98% removal	60-70% removal	60-70% removal
BOD remains	300mg/L	300mg/L	210mg/L	180mg/L	BOD < 300mg/L	BOD < 300mg/L
Suspended	600mg/L	-	180mg/L	-	S.S. < 300mg/L	S.S. < 300mg/L
D.T.	Negligible	10-20m.	1-1.5Hrs	4-6Hrs	1.5 - 2 Hrs.	1.5 - 2 Hrs.

Explain industrial wastewater treatment unit with flow diagram

- K2 -

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- | | | |
|-----------------------------------|---|---|
| (1) Preliminary treatment unit |  | Removal of floating materials |
| (2) Physical treatment |  | Removal of suspended particles + removal of oil and grease |
| (3) Physico-chemical treatment |  | Removal of colloidal particles with use of chemical coagulants. |
| (4) Biological treatment |  | Removal of soluble organic matter by aerobic/anaerobic system |
| (5) Advanced wastewater treatment | 

 | Chlorination/Disinfection & recovery of Nitrogen/Phosphorous and valuable metals before disposal in natural water course. |

To natural water course.

4.1 Understand aims/objects of preliminary treatment.

As it includes removal of coarse heavy solids like sand gravel, coarse floating matter and settleable suspended solids, aim of this treatment is to reduce the load on sequential treatment (mainly of oxidation load)

5. Understand the aims/objects of secondary treatment.

as primary treatment works on the sequential and hydraulic principles as secondary treatment based on biological principle. i.e. involvement of biomass for oxidation and reduction process.

5.6

Describe the objects of industrial wastewater treatment - 163-

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- To reduce the strength of waste water that it may not pollute receiving water.
- To reduce its volume in general
- To destroy the Pathogens
- To recover its industrial i.e. recovery of heavy metals value
- To enable it safe and satisfactory i.e. no further load comes over receiving water or no depletion in DO level of natural water course.

5.7 Explain the various units of primary treatment.

- (i) Screening chamber
- (ii) Grit chamber or Debitus tank
- (iii) Skimming tank
- (iv) Grease tank

5.7.1 Know screening

Screen having opening of uniform size rectangular or circular in shape.

5.7.2 Know the purpose of screening as "All the suspended and floating matter like tree laves, cloths, paper, kitchen, refuse, pieces of wood, cork, fibre, gravel etc. The large size floating and suspended matter can be removed by pouring wastewater through screens, the removed matter is known as screening."

5.7.3 Narrate the object of screen as

- To prevent the formation of unexpected slum in settling tank and aeration tanks.
- To prevent clogging of sprinkling nozzles.
- To prevent formation of floating matters in the receiving bodies of water.
- To protect pumps at the plant and outfalls.
- To prevent clogging of T.F.

5.7.4 Explain types/classification of screen on the basis of their construction

As rack, as bar screen, wiremesh, perforated screen
Coarse, medium, fine

types	Class	Size of opening in mm.
racks	Coarse	more than 50
or	medium	25 ^{to} 50
screen	fine	less than 25
-on		
screen	medium	6-10
-on	fine	less than 6

5.7.5 Explain different mode of disposal of screenings

burnt, or burned digestion dumping in low lying areas dumping in sea water.

5.8 Explain grit as " The first runoff during monsoon contains lots of grit sand and clay. also while streets are washed it gets entry into system, also comes through service station, garbages etc, also it comes through utilities, cleaning operation because of the cleaning with ash or earth or cleaning powder.

5.8.1 Explain grit chamber unit

They are long basis enlarged channels constructed at treatment plant to remove sand and grit from waste water.

5.8.2 Know the necessity of washing grit before disposal

Because mostly it has 2 to 5% of biodegradable organic matter which may create anaerobic condition later on hence washing is done before final disposal.

5.9 Skimming tank These are meant for removing oil and grease from wastewater. It is a chamber so arranged that the floating matter rises and remains on the surface of the wastewater until removed while the liquid flows out continuously under baffles.

5.9.1 Understand the locations and constructional details of skimming tank.

Construction details
It is long chamber through shaped structure divided into two or three lateral compartments by vertical partitions

- These tanks where with compressed air which escapes from porous plates at their bottom, the floating matter is removed by hand or mechanically
- The amount of grease put removed is : to economical use it may be converted into soap, candles lubricants etc.
- The skimming usually disposed of by burnt or burning.

5.10 Explain the function of detritus tank with their construction details.

- It is similar to grit chamber
- There are two tanks the C.D. upper portion is rectangular while the lower portion is trapezoidal, valves are provided at inlet and outlet sludge is removed by under drains provided many times settled sand is taken out through inclined channel.

functions
- They remove particles finer than those removed by grit chamber. Detention time is kept about 4 to 5 minutes velocity of flow 30 cm/sec. Efficiency about 10% of suspended matters are removed which is taken off continuously by means of scrapers.

5.11 Explain discrete particles

Any particles which does not change its size and weight while rising up or setting down in any fluid is known as discrete particle.

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5.12 State the aims of sedimentation

- To remove gross solids from sewage and finally the BOD
- Sewage prepare for biological treatment
- Reduce the choking problem of trickling filter
- Secondary sedimentation removes precipitated solids from the wastewater
- To increase the efficiency of disinfection of wastewater
- Chemical coagulation reduces load over intermediate treatment

5.12.1 Know the design criteria of sedimentation tank

Detention time 1 to 3 hours

Surface loading

- For granular solids 15,000 to 2,00,000 lit/sq m./day
- sewage solids 40,000 to 1,00,000 lit/sq m./day
- Flocculant material 50,000 to 65,000 lit/sq m./day
- Common surface loading rate 50,000 lit/sq m./day
- velocity of flow 15 cu.m./min. to 30 cu.m./min.

Width to length ratio

- for rectangular tank
- maxm width of flowing channel
- for circular tank

1:5 1:4
 6 to 7.5 meter.
 Dia. maximum to 60 m.

- Depth should not exceed 3 m.

5.13.1 Understand biological Oxidation and reduction

Explains aerobic and anaerobic Bio-reactions.

5.13.2 Know merits and demerits of aerobic and anaerobic bio reactions on the basis of

- Cost
- Detention time
- Retention rate
- Hydraulic rating
- Organic loading
- Bio recovery
- Power involvement
- Maintenance
- Sludge disposal

5.14 Understand oxidation pond

- Principle of working based on photosynthesis
- Extreme simplicity and reliability of operation
- No chances of equipment failure
- Based on (S.K.F.) climate favour
- Fit where land is inexpensive
- Does not need any skill supervision

5.14.1 Explain factors affecting pond ecosystem on abiotic and biotic basis

Abiotic systems are $O_2, CO_2,$ water, light and nutrients.

- Wastewater characteristics and fluctuations.
- Environmental factors (Radiation, light, temperature and their fluctuation)
- Algal growth patterns and their diurnal & seasonal variations.
- Bacterial growth patterns and decay rates.
- Hydraulic transport patterns
- Evaporation and seepage
- Solid settlement, liquification, gasification upward diffusion, sludge accumulation
- Gas transfer at interface

5.14.2 Describe different kinds of oxidation ponds

(i) Aerobic pond

shallow about 0.3 m. deep designed for maximum sunlight penetration to maintain aerobic condition all time, The transmittance should not be less than 65%.

(ii) Anaerobic pond

Require no dissolved O₂ for microbial activity, as the anaerobic and facultative organisms use O₂ (oxygen) from composed like nitrates and sulphates as their Hydrogen acceptors, and give end product like CO₂ & CH₄

- They are deeper about 3 to 4 meter.
- They are named as unheated and unstirred open digester
- The effluent are not fit for discharge without further treatment.
- Often provided in tandem with facultative ponds which follow them.

(iii) Facultative ponds

- are partly aerobic and partly anaerobic
- The depth in the 2m. transmisson must be more than 60%

- Purification process is based on algal as well as facultative microorganism

Such ponds are predominantly re-aerobic during sunshine hours as well as few hours of night and in remaining few hours the pond bottom turns anaerobic

- Benthic debris are generally anaerobic beyond the first few millimeters from the solid water interface.

- Most of the existing stabilization ponds in the world are facultative type with varying degrees of aerobicity and anaerobicity.

5.14.3 Describe the functions of ponds as primary and secondary ponds.

- Pond receiving untreated wastewater serve as settling tank, equalisation tank, and reduction of few degree of BOD in it is termed as primary tank.
- Pond receiving primary treated or biologically treated wastewater for further treatment are called secondary ponds, and termed as maturation pond, fishpond, aquatic plantpond.

5.14.4 Explain nutrient algae

Experimental formulae

- $C_{106}H_{150}O_{45}N_{16}P_1$
- $C_{106}H_{263}O_{110}N_{16}P_1$
- the relative proportion of C:N:P: 40:7:1
- the proportion in domestic sewage is about C:N:P 11:4:3.7:1
- The carbon is limiting and BOD is fully removed while few N and P are there so some BOD is added to remove residual N & P
- The proportion in industrial effluent of C:N:P quite variable and in some cases N & P are artificially added to get better algal growth.

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5.15 Explain the different important points which influence, construction, working and maintainance of oxidation ponds.

- Location
 - Must be within 1/2 km away from residential areas.
 - Must get maximum sunlight
 - The wind direction should not be towards residential area
 - The maximum advantage of natural slope must be taken
- Banks of ponds
 - No vegetation at all
 - No need of lining at all
 - properly plane
- Entrance
 - It must be well known
 - Surface area loading must be known
 - Knowledge of characterisation must be known to fix the theoretical Detention time is determined by regulating the velocity and characteristics of effluent from pond.
- Points in relation to public health
 - There must be no pathogens in effluent of pond i.e. (Coliform & Steptococci) killed must be less than 0.0001 %
 - Shaeigella must be destroyed by all means.
 - Parasitic jnaba, Helicomenthaus must be zero at any cost.
 - Viruses should not be more than (0% to 2%) in pond effluent
 - Such formation flies nuisance, and mosquitos breeding is not allowable

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- Exit
 - vegetable growth is not permissible near water table because growth of vegetable interference in microbial activity
 - It must be fixed and known
 - It must be in such location that oxidised effluent exit easily and located at such position that at this point there must be 22 cm depth of water constantly thus it does not interfere in algae, scum and other activities.
- Maintenance
 - The inside of tank and bank must be free from vegetable growth.
- Sludge
 - Scum removal arrangement
 - It accumulates 3 to 5 cuft/annum/person
 - If excess deposition of sludge takes place in that case the flow is stopped and pond is allowed to dry and this dry sludge can be sold off in ^{the} form of soil conditioners due to its N.P.K. contents.
- Pond arrangement
 - For more than 15 acres multiple units are built
 - Every unit must be same in all aspects.
 - They may be built in series and parallel according to need and land availability. If kept in series the first pond may be kept deeper than followers
- Pond starting
 - The pond is filled with sewage mixture of sewage + water
 - No need of cultural seed of algae.
 - Once the algal growth starts wastewater of known characteristics is allowed to pond for treatment.

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TOPIC - 6 BIOLOGICAL TREATMENT UNITS.

S.No.	General Objective/ Specific Objectives	Content
6.1	Understand the necessity of Biological treatment	Due to presence of high concentration of Biodegradable materials biological treatment is necessary.
6.1.1	Know about importance of BOD/COD ratio in biological treatment	<p>- If $\frac{BOD}{COD} > 0.6$</p> <p>The biological treatment can be done without acclimatization</p> <p>If $\frac{BOD}{COD} < 0.6$ to 0.3</p> <p>Acclimatization is needed</p> <p>- If $\frac{BOD}{COD} < 0.3$</p> <p>The biological treatment may not be necessary</p>
6.1.2	Know term acclimatization as "Gradual exposure of the wastewater in increasing initial microbiological population under controlled condition.	
6.1.3	Know nutrient ratios for aerobic biological treatment.	<p>BOD ; Nitrogen ; Phosphorous</p> <p>100 : 5 : 1</p> <p>100 : 2.5 : 1/2</p>
6.1.4	Know about chlorination as	<p>- Post chlorination</p> <p>- Directly disinfection adopted in low BOD effluent due to oxidising action to reduce BOD as close as 0.3 mg/l.</p> <p>- Preliminary for reducing odour by breakdown sulphur compound as dose 25 mg/l.</p> <p>- Split chlorination while use pre and post of treatment process.</p>

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6.2 Understand the biooxidation/bioreduction.

6.2.1 Distinguish between attached growth system & suspended growth system

It utilizes a solid medium upon which bacterial solids are accumulated in order to maintain a high population. This process maintains an adequate biological ~~form~~ in suspension within the reactor by employing either natural or mechanical mixing.

6.2.2 Know attached growth system as

- Trickling filter : Aerobic system
- Rotating biological DDC :
- Fixed film fixed bed batch reactor : Anaerobic system
- Rotating biological DDC :

6.2.3 Know suspended growth system as

- Activated sludge process : Aerobic system
- Oxidation ditch :
- Fluidised Bed reactor : Anaerobic system
- Upflow sludge blanket reactor :

6.3 Explain aerobic attached growth system as Trickling filter

It consists of open beds of coarse aggregates over which (sewage) effluent is sprinkled intermittently continuously.

The necessary contact surface for growth of aerobic bacteria is provided by the aggregates in the bed and the aeration is provided by nature.

6.3.1 Know working operations of Trickling filter with diagram

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- arms rotate @ 1/2 rpm for large distribution to 2 rpm for small distribution.
- Arms are kept 15 to 20 cm above the top surface of media in tank.
- Effluent get entry by nozzle for dosing 3 to 5 minutes and then rested for 5 to 10 minutes before next application.
- Media is material as cubically broken stone or slag free from dust of size 25 mm to 75 mm & sufficiently hard (12 on Brinell's hardness machine) placed in layers.
- Depth 2 to 3 m.
- Bottom slope 1 in 300 to collect effluent for further treatment if, necessary.

6.3.2 Explain various types of Trickling filter as

- (i) Conventional Trickling filter or ordinary trickling filter or standard or low rate trickling filter
- (ii) High rate Trickling filter.

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3 Know merits of trickling filter.

- B.O.D. loading range for low Trickling filter
900 - 2200 kg / ha
- for high trickling filter
6000 - 18000 kg/ ha
- Hydraulic loading range between
L.T.F. 22-44 ml/hr/day
H.T.F. 110-330 ml/hr/day
- n- 75% to 90% BOD removed
- working simple no supervision required.
- Great flexibility in operation and loading.
- self cleaning
- Mechanically wear & tear is small due to less mechanical equipment
- M.C. of sludge obtained from T.F. is as high as 99% or so.
- Temperature influence BOD removal capacity of system. High^r the temperature high^r BOD removal upto 90%
- suitable Indian condition

4 Know demerits of trickling filter.

- The head loss is high making automatic dosing of filters necessary (15 cm)
- Initial cost of construction is high.
- Sedimentation process is necessary before reaching to trickling filter for effluent.

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6.3.5 Explain comparison of L.F.F. and H.T.F. on the basis of

- depth of filter media
- size of filter media
- land required
- cost of operation
- method of operation
- type of effluent produced
- dosing interval
- filter loading values
 - Hydraulic loading
 - Organic loading
- Recirculation system
- quality of secondary sludge produced
- efficiency

6.4 Know rotating biological Discs/Contractors

These consist of a basin containing mechanically driven rotors which provide a large surface area for biological growth.

6.4.1 Explain constructional/operational details with diagram.

- 3m in dia, 10 mm thick and placed 30 to 40 mm on center along a shaft of variable length made up of G. sheet/plastic sheet.
- Rotates at 1 to 2 rt/min.
- Quantity of sludge produced amount to approximately 0.4 kg/kg BOD₅ applied
- Hydraulic loading 0.04 - 0.06 m/day
- BOD₅ loading 0.05 - 0.06 kg/sq.m/day based on disk surface area

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6.4.2 Know merits/demerits of rotating biological disk:

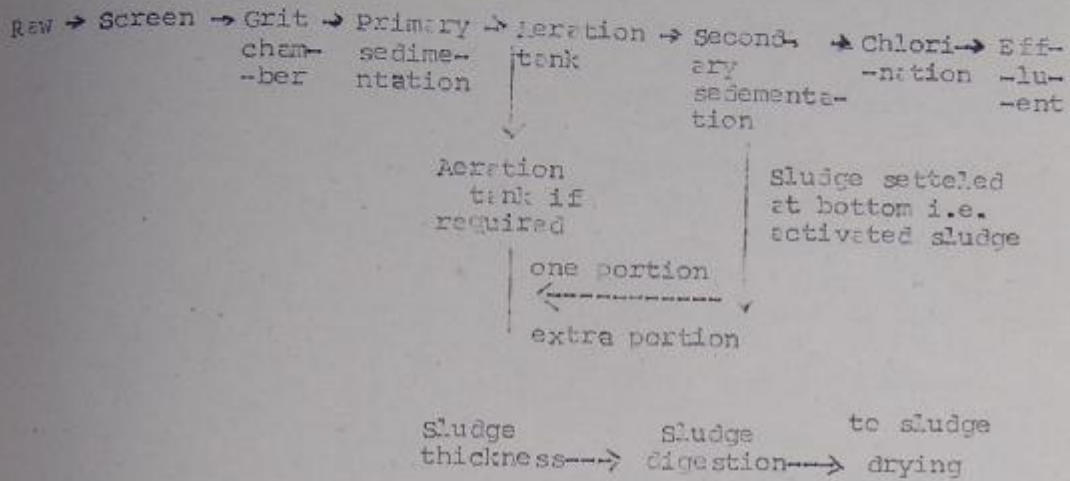
- New technology in aerobic system
- Initial cost high
- But lower than other biological system
- must be protected from rain otherwise slim growth layer may strip off.
- not suitable for low temp .
- $\eta = 75\% - 85\%$

6.5 Explain aerobic suspended growth system as "activated sludge process"

Sewage effluent from primary sedimentation tank which is thus normally utilised in this process is mixed with 20 to 30 % of own volume of activated sludge which contains a large concentration of highly active aerobic microorganism. The mixture enters an aerobic tank where the microorganism and sewage effluent intimately mixed together, with a large quantity of air for about 4 to 8 hours, under these conditions the moving organism will oxidise the organic matter and the suspended and colloidal matter tends to coagulate and forms a precipitate, which settles down readily in the secondary settling tank. The settled sludge (containing microorganism) called activated sludge to the head of aeration tank to be mixed again with the sewage being treated.

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6.6 Know working operations and units of a conventional activated sludge process with diagram -178-



6.6.1 explain various methods of activated sludge processes

- Conventional process.
- Tapered aeration activated sludge
- Step aeration activated sludge
- Completely mixed activated sludge

- Know merits of Activated
sludge process

- It offers secondary treatment with minimum area requirements and effluent of high quality is obtained.
- Capital cost of an A.S.P. is less
- Loss of head through the plant is less
- lesser land area required
- no fly or odour nuisance
- greater flexibility of operation
- Detention time is less 2 to 3 hrs.
- lesser amount of return sludge (10 - 25%) of effluent flow
- smaller amount of air ($3.13 \text{ m}^3/\text{m}^2$ of effluent treated)
- Removal of 70-80% of suspended solids
- removal of BOD 80-85%

6.6.2 Know disadvantages of A.S.P.

- High cost of operation with greater power consumption
- lot of machinery to be handled
- sudden change in quantity and quality of effluent may produce interference and may cause inferior effluent
- Bulking of sludge is common
- The quality and quantity of return sludge is adjusted every time.

6.6.3 Know factors affecting the A.S.P.

- Availability of land for plant
- Availability of suitable sludge disposal method
- Cost and availability of power
- m/c initial and operational cost
- Degree of flexibility required in operation
- The quantity and quality of effluent
- high maintenance cost.

6.6.4 Explain bulking of sludge

as " In the settled sludge that is obtained in the secondary settling tank contains more than 98 to 99% of moisture under extreme or sick condition resulting in the swelling of the sludge volume.

6.6.5 Know factors affecting in development of sludge bulking

- Presence of harmful industrial waste contains high concentration of carbohydrate, antiseptic etc.
- Aeration below required degree
- Accumulation of sludge at bottom aeration tank.
- higher detention time in classifiers
- sudden change in character of sewage
- Great interference in secondary classifiers working due to bulking of sludge
- large volume of sludge will have to be handled

6.6.6 Know various remedial
measures to control
bulking of sludge

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- Take special care
against such industries
- Higher degree of
chlorination
- Enhancement in aeration
- Loading time for raising
the pH to 8 or more
- By reducing the suspended
sludge
- By re-aerating the returned
activated sludge

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6.6.7 Define the aeration tank loading as

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(i) Aeration period (H.R.T.)

$t = v/q \times 24$ hours
 t = aeration period in hours
 v = volume of aeration tank m^3

Q = Quantity of waste flow into aeration tank excluding the quantity of recycled sludge

(ii) volumetric BOD loading

$\frac{QY_0 \text{ (gm)}}{v \text{ (m}^3\text{)}}$
 Q = sewage flow in aeration tank in m^3
 Y_0 = BOD_5 in mg/l. of influent sewage (gm/m^3)
 V = aeration tank volume in m^3

(iii) food to organism ratio

Daily BOD load applied to the aerator system
 $F/M = \frac{\text{in gm}}{\text{Total microbial mass in the system}}$

Lower the F/M ratio higher will be the BOD removal in the plant

(iv) Sludge age

$\theta_c = \frac{M.L.S.S. \text{ in the system (M)}}{\text{Mass of solids leaving the system per day}}$

(iva) Mass of the solids in reactor

$M = V \times M.L.S.S. = V \times X_t$
where $M.L.S.S. = X_t$

(ivb) Total solids removed from system/day

Mass of solids removed with the wasted sludge/day mass of solid removed with the effluent / day
 $Q_w \times X_t + (Q-Q_w) \times E$

6.6.8 Design parameter for convention at activated sludge plant as

S.No.	Parameter / loading	Design value
1.	MLSS	1500-3000 mg/l
2.	MLVSS/MLSS	0.8
3.	F/M Ratio	0.4 to 0.2
4.	H.R.T.	4 to 8 h-rs.
5.	Volumetric loading as gm of BOD applied /m ³ of tank	300-700
6.	$\frac{\text{volume of return sludge QR}}{\text{volume of influent sludge Q}}$	0.25 to 0.5
7.	BOD removal efficiency	85 to 95%
8.	Kg of O ₂ required per Kg of BOD removal	0.8 to 1.1
9.	Air required per kg of BOD removal	40-100 m ³
6.7.1	<p>Expalin sludge volume Index as "Physical state of the sludge produced in a biological aeration system (Range 50-150 ml/gm indicate good settling sludge.</p>	<p>Volume occupied in lit. ml/l One gm of solid in mixed liquor after settling per 30 min.</p> $S.V.I. = \frac{V}{x} \times 1000 \text{ ml/gm}$
6.7.2	Describe oxidation ditch as "Improved A.S.P. or Extended aeration system	
6.7.3	Know about oxidation ditch	<ul style="list-style-type: none"> - Economical upto 1.5 lacks population discharge - depth 1 to 1.5 m. - placed parallel by keeping 1m to 5m width, and 2 to 4m working place between each unit. - water lightness is essential - Surface rotor horizontal axis rotor are used for agitating and circulating wastewater. - at the sludge settling the rotors are stopped 2 hours minimum - a part of settled sludge is used for recirculation

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- 6.9.5 Know features of UNITTS two stage reactor as
 - material used PVC tube or depends
 - Height of column 215 cm max.
 - internal dia of column 10 cm min.
 - height of media 150 cm min.
 - volume of media about 60% of total volume
 - surface area of
 - Stone media 4.5 times of voids
 - nylon bed 4.5 times of voids (app.)
 - shape of reactor circular/rectangular cylindrical/column

- 6.10 Understand phenomenon of sewer crown deterioration
 - define self cleansing velocity
 - State the causes for sewer surface deterioration
 - suggest the remedial measures for prevention from above
 - Chlorination
 - removal of benthal sludge periodically

- 6.11.1 Understand phenomena of gas formation in well
 - State the different causes of gas formation
 - Suggest the remedial measures for prevention
 - Dilution by air blowing in well by different methods.

- Detention time 12-15 hours of 800 to 2500 lit./kg of BOD load present in the wastewater is admitted
- MLSS 4000-5000 mg/L
- Volume of ditch approximately 120-150/cum/ meter length of ditch
- Length of horizontal cage type rotor used in 1 m.
- The diameter of rotor 0.7m.
- speed of rotor 75 rpm while rotor dip 10 cm into liquid
- removal of suspended solids upto 95%
- BOD removal upto 98 %
- Useful for small industries also

- provide better results while use in pharmaceuticals, canning, dairy etc. industries etc.
- Power requirement about 4.4 kw per kg of BOD removal

8 Explain mechanically aerated lagoons as

"Deeper oxidation pond with O_2 introduced by mechanical aerators as these ponds are deeper than oxidation ponds with less Detention time and area required.

- 6.8.1 Know important features of mechanically aerated lagoon.
- Depth 2.4 to 3.6 m.
 - D.T 4 to 6 hours
 - Land area 5 to 10% of oxidation pond
 - BOD removal 65 to 90%
 - generally used in industrial wastewater treatment
- 6.9 Understand choice for anaerobic treatment over aerobic treatment system as "Organic matter conc. in term COD is more than 1500 mg/L need high air transfer for aerobic treatment thus uneconomical and high quantity sludge handling problem
- 6.9.1 Know advantages of anaerobic treatment
- Suitable for soluble waste
 - No need of recycle
 - low volume of sludge produced
 - no power involvement thus can be named as low cost treatment
 - Use ful for higher concentration of organic waste in terms of COD (more than 1500 mg/L)
 - bio recovery is possible (about 70% of CH₄) within FM range 6.4-7.6 at low Detention time
 - Low observance and maintenance cost thus economical
 - no intermediate classifier needed
 - variable BOD loading is possible
 - ^{High} Treatment efficiency

6.9.2 Know different anaerobic treatment system as

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- Attached growth system
- Suspended growth or non attached biomass system

- Fixed film
- Submerged filter
- Moving bed rotating biological contactor
- Expanded bed
- Fluidized bed
- Recycle bed

6.9.3 Explain upflow fixed film fixed bed batch reactor with diagram.

- sludge blanket digester
- Height-Max 2.4 m for single stage
Max 1.5 m for two stages.
Height/ Diameter 10 to 15 media used
H.R.T. -1 to 2.5 day
Organic loading 0.6kg/m³/day to 60 kg/m³/day

6.9.4. Know features of UFFB single stage reactor as

- material used
- total length of column
- internal dia of column
- height of stone media
- volume of stone media
- volume of void
- surface area of stone media
- stone size
- shape of reactor

- perspex or depends 245 cm max.
- 11.5 cm min.
- 170 cm
- about 60% of total volume
- about 40% of total volume
- 4.5 times of voids (approx.)
- (30 mm. to 50 mm.)
- general circular/rectangular/cylindrical/column

PROGRAMME : DIPLOMA IN CONSTRUCTION TECHNOLOGY AND
MANAGEMENT
COURSE : ENVIRONMENTAL ENGINEERING
COURSE CODE NO : CTM -606
PREREQUISITE : CTM -302

List of practicals/ visits suggested

- (1) Determination of PH
(a) by pH meter
(b) by orion analyser
 - (2) Determination of acidity as CaCO_3 by titration method
 - (3) Determination alkalinity as CaCO_3 by titration method
 - (4) Determination of turbidity by
(a) Jackson turbidity meter
(b) N.T. turbidity meter
 - (5) Determination of apparent colour by spectrophotometer
True colour by spectrophotometer
 - (6) Determination of D.O. by titration method
by D.O. probe
 - (7) Determination of BOD by dilution technique.
 - (8) Determination of COD by reflux titration method
 - (9) Determination of total nitrogen by Kjeldahl micro method
 - (10) Determination of NH_3 (N) by reflux and titration by orion
analyser method
 - (11) Determination of NO_2 (N) by reflux and titration, by orion
analyser method
 - (12) Determination of NO_3 (N) by reflux and titration, by orion
analyser method
 - (13) Determination of SO_4 by orion analyser, by spectrophotometer
 - (14) Determination of PO_4 by orion analyser, by spectrophotometer
 - (15) Determination of Na, K, Li, Ca, by photoflame meter
Na, K, Li, Ca, Mn by Orion analyser
 - (16) Demonstration of the Atomic absorber for determination
of heavy metal in Wastewater. (Cd, Cr, Pb, Zn, Cu etc.)
 - (17) Determination of MPN number in wastewater
 - (18) Determination of bacterial density by colony counter method
 - (19) Determination to learn isolation technique for aerobic
bacteria & fungi, algae slides.
 - (20) Demonstration of bacterial, fungi, algae slides to identify
and know the characteristics of each species.
- At least 12 practicals have to be performed by each student

DIPLOMA COURSE IN CIVIL ENGINEERING

C - 607 COMPUTER AIDED DESIGN

R A T I O N A L E

Computer based approaches are replacing traditional methods of drafting and designing. Latest computer hard wares, have made drafting and designing more accurate and faster. Plot scribers, plotters and digitizers are some such examples. Different softwares are continuously made available to assist in design and drafting.

Autocad has proved to be a highly effective software for engineering design and drafting. Thus a course on computer aided design has become highly desirable at the diversified level in the Diploma course in CIVIL ENGINEERING.

It may however be stated that in this curriculum emphasis is placed on designing for planning of a structure rather structural analysis and design.

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INDIAN COUNCIL BOARD OF TECHNICAL EDUCATION, MUMBAI
 DIPLOMA COURSE IN CIVIL ENGINEERING

C- 607 COMPUTER AIDED DESIGN

PRE REQUISITES : 301

LIST OF TOPICS

S.No.	Details	No. of Hours		
		L	F	Total
1.	Graphics through Basic	12	6	18
1.	Hardware	04	-	04
3.	Software	14	10	24
4.	Civil Engineering Application	14	10	24
5.	Projects	04	08	12
TOTAL		48	32	80

SCHEME OF EXAMINATION

Hours/ week	Cred- its.	Sessional		Progressive Assessment.		Board Exam. Paper Dur.	Th. Ma.	Prac Exam.				
		T.W.	L.W.	I	II			Pr.	Du	Ma		
th.	Pr.							ks.				
1	2	4	20	20	10	10	1	3Hrs.	100	1	3	50
Hrs.												

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DIPLOMA COURSE IN CIVIL ENGINEERING

C-607 COMPUTER AIDED DESIGN

COURSE CONTENTS.

Topic 1: GRAPHICS THROUGH BASIC :

Use of computer language in computer graphics and CAD, Graphic Statements in Q-Basic, preparation of simple programs, Computer Graphics terminology, Graphics Software, some geometrical models to the given specifications.

Topic 2: HARD WIRE :

Stand alone CAD system and CAD Work station, input and output devices of CAD Systems, resolution of System Components, Computer Graphic Hardware.

Topic 3: SOFTWARES :

3.1 Autocad :

Utility of AUTO CAD, Various commands associated with AUTO CAD, Concept of layer block and attribute features of Auto CAD release II mesh, D view paper space.

3.2 Lotus 1-2-3

Report generation, types of files, commands to prepare spread sheets and graphics- Global, FORMAT, label, Column, row width, Copy MOVE, Insert, Print Formula and Functions, Graphs and their printing.

3.3 WORD STAR

Use WORDSTAR for report generation word processing, capabilities of word processing software- file creation, file editing, file printing, Moving and understanding, capitalising.

Topic 4: CIVIL ENGINEERING APPLICATIONS :

Manual solutions of identified simple engineering problems and estimation, say, a residential building, procedures for using relating software, preparation of reports for the problem using WORDSTAR, LOTUS 1-2-3, AUTOCAD AS PER requirements.

Topic 5: PROJECT WORK :

Manual solution of a small civil engineering construction such a residential building, water tank, Retaining wall, Truss etc. AUTO CAD to prepare the design drawing and estimate, prepare the report with the help of processing/Lotus 1-2-3

LIST OF PRACTICALS

1. Preparing a small program using Q-BASIC version-4 (limited commands)
2. Preparing a small program using Q-BASIC v-4 (other commands to be added)
3. Constructing models like circle, square, conics, curves using Graphic Commands of Q BASIC v-4.
4. Constructing the following diagrams using graphic commands of Q BASIC v-4.
 - a) Plan, elevation, sections of building elements furniture detailing etc.
 - b) Sections of beams and columns of steel.
 - c) Trusses
 - d) B.M. and S.F. diagrams.
5. Using auto cad commands to generate different geometrical designs.
6. Using WORDSTAR 2000 for writing reports and generating documents.
7. Using civil engineering software like ISDS/STAAD-III to find the solution to a given problem.

LIST OF BOOKS/MANUALS

1. Manuals of BASIC, Q BASIC version-IV
2. Manuals of AUTOCAD
3. Manuals of LOTUS 1-2-3
4. Manuals of D Base - III
5. Manuals of WORDSTAR - 2000

BOOKS

TITLE	AUTHOR	PUBLISHER	APPROX COST.
1. The illustrated AUTOCAD Book	Tom Berghau- -ser Paul L. Schli- -eve	SKM Enterprises, New Delhi.	Rs. 90/-
2. Understanding Computer Graphics	Judy Tatchell Les Howerth	Usborne Comp- -ter Books.	£ 2.25
3. Word Process- ing Essential concepts.	Marilyn Popyk	Mc Graw-Hill	\$ 14.5
4. 1-2-3 The Complete Reference	Mary Campbell	Osborne Mc Graw Hill	\$ 22.9
5. Computer Aided Drafting & Design	Donald D. Voisinet.	Mc Graw Hill New Delhi	Rs. 80/-
6. Engineering Graphics and Application	David I cook	Holt saunders International	\$ 15.9

LIST OF DEMONSTRATIONS

1. Demonstration of minimum four ready made programs in Q BASIC for illustrating the graphic potential of the language.
2. Functioning of the various hardwares of C/D systems.
3. Use of AUTOCAD (few ready made programs)
4. Use of LOTUS 1-2-3 Package.
5. Use of WORDSTAR 2000 package.
6. Solving four Civil Engineering problems using soft-ware/ Programmes generated for the purpose.

NOTE:-

About 8 Practical hours may be utilised for the above demonstrations.

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LIST OF EQUIPMENT

1. IBM PC-AT 80 386 SX with high resolution monochrome monitor.

Memory - i) RAM 2 MB (Expandable to 4 MB)
 ii) Hard Disk 40 MB winchester Drive with controller.
 iii) Floppy Disk Drive (5 $\frac{1}{4}$) with controller (1.2 MB)
 iv) VGA Monitor 14"
 v) 80387 coprocessors.

Keyboard - I.S.C.E.E Standard

Printer - Dot Matrix Printer. 132 column, with 300 CFS

Operating System - DOS/UNIX
2. Graphic Plotter : A1 size Single pen plotter
3. Digitizing Pad : A3/A4 Size
4. Mouse
5. Light Pen

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING. PROJECT.
COURSE : ADVANCED ENTREPRENEURSHIP AND
COURSE CODE NO.: C-608 /CTM 511
PREREQUISITE : CTM 403

SCHEME OF STUDIES

S.No.	Topic	Th. Hrs.	Pr. Hrs.	Total
1.	Managing an Enterprise.	07	-	07
2.	Sales Techniques and Promotion.	07	-	07
3.	Cost control and Monitoring.	06	-	06
4.	Manpower Management and Industrial Relations.	06	-	06
5.	Problems and Remedies.	06	-	06
6.	Visit to different Project/ Industries and to prepare project Group discussion.	-	96	96
TOTAL		32	96	128

CREDITS : 5

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.
COURSE : ADVANCE ENTREPRENEURSHIP AND PROJECT.
COURSE CODE NO.: C-608/CTM 511
PREREQUISITE :

S.No.	Topic	CONTENTS OUTLINE	HRS. TH.	PR.
1.	Managine & Enterprise.	Definition of Management, Basic functions of managers, Appropriate organisation structure, Delegation span of Control.		
		Purchase procedure, Elements of a sound Purchase System, Inventory-control, ABC analysis, Phases of production Planning and control process, Importance of production Control.		
2.	Sales Tech- -niques & Promotion.	Significance of Sales forecast Methods of forecasting sales, Sales Promotion-techniques, Selection of Appropriate channels compensation and incentives to sales staff.		
3.	Cost control & monitoring.	Elements of cost, calculation of unit cost, Calculation of Break-even point Budgeting-Budgetory control, Standard costs variances and Budgetory control. Monitoring progress of project Periodical cost variances, Remedial action		
4.	Man Power Management & Industrial Relations.	Factors affecting Productivity, Importance of training & development styles of Leadership, adoption of appropriate style of Leadership, Need of industrial Relations and peace, causes of Industrial disputes, Methods of settling Industrial disputes Unionism. -Role of Trade union for maintaining Industrial Peace.		
5.	Problems & remedies.	Factors giving rise to the problems, symptoms of sickness, scientific problem solving -DATA collection, alternative strategies, Govt. supports, Structural changes. Selection of an appropriate strategy for given cases of Industrial sickness with scheduling.		

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
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PROGRAMME : DIPLOMA IN CIVIL ENGINEERING.

COURSE : ADVANCE ENTREPRENEURSHIP AND PROJECT.

COURSE CODE No.: C-608/CTM 511

PREREQUISITE : CTM 403

LIST OF PRACTICALS.

- (1) Field visits are to be arranged.
- (2) Group discussions
- (3) Project work.

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