

OUTCOME BASED CURRICULUM 2016

Program Diploma in Civil Engineering



**Government Polytechnic,
Nagpur**

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To become a Center of Excellence, providing quality technical education and training

Mission of Institute

The mission of Government Polytechnic, Nagpur is-

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- M2** : To inculcate values and ethics for life-long learning through curricular, co-curricular and extra-curricular activities
- M3** : To develop facilities and services for academic excellence
- M4** : To enhance the skills of faculties and staff through industry institute collaboration

OUTCOME BASED CURRICULUM 2016



Program: Diploma in Civil Engineering



by

Curriculum Development Cell,

Government Polytechnic, Nagpur

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DIPLOMA IN CIVIL ENGINEERING

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TABLE OF CONTENTS

LIST OF FIGURES	XX
LIST OF TABLES	XXI
CHAPTER 1 GOVERNMENT POLYTECHNIC, NAGPUR AN INTRODUCTION	
.....	1
1.1 History	1
1.2 Autonomy	1
1.3 Awards	2
1.4 Geographical Location of Nagpur City	2
1.5 Government Polytechnic, Nagpur Campus	3
CHAPTER 2 POLYTECHNIC EDUCATION SYSTEM	5
2.1 Higher Education System in India	5
2.1.1 Department of Higher Education, MHRD	7
2.1.2 All India Council for Technical Education (AICTE).....	7
2.1.3 National Board of Accreditation (NBA)	7
2.1.4 Higher and Technical Education, Government of Maharashtra.....	8
2.1.5 Directorate of Technical Education (DTE), Government of Maharashtra.....	8
2.1.6 Maharashtra State Board of Technical Education (MSBTE).....	9
2.2 Polytechnic Education System	9
CHAPTER 3 CURRICULUM DEVELOPMENT SYSTEM.....	11
3.1 Organizational Structure of GPN	11
3.2 Curriculum Development System	12

3.2.1	Governing Board (GB).....	13
3.2.2	Board of Studies (BOS).....	14
3.2.3	Program Wise Board of Studies (PBOS)	15
3.2.4	Advisory Board (AB).....	15
CHAPTER 4 OUTCOME BASED EDUCATION PHILOSOPHY		16
4.1	Outcome Based Education	16
4.2	KEY constituents of OBE	17
4.2.1	Vision	18
4.2.2	Mission.....	18
4.2.3	Graduate Attributes (GA's).....	18
4.2.4	Program Outcomes (PO's)	18
4.2.5	Program Educational Objectives (PEO's).....	19
4.2.6	Program Specific Outcomes (PSO's).....	19
4.2.7	CourseOutcomes (CO's)	19
4.2.8	Specific Learning Outcomes (SLO's) or Learning Outcomes (LO's)	20
CHAPTER 5 BLOOM'S TAXONOMY.....		21
5.1	Introduction to Bloom's Taxonomy	21
5.2	Domains of Learning.....	22
5.2.1	Cognitive Domain	22
5.2.2	Psychomotor Domain.....	24
5.2.3	Affective Domain.....	25
5.3	Program Outcomes and Domains of Learning.....	27

CHAPTER 6 CURRICULUM REVISION PROCESS.....	28
6.1 Change Management.....	28
6.1.1 ADKAR Model for Change Management	29
6.1.2 Results of ADKAR Model	30
6.2 Curriculum Revision Process	30
6.2.1 Study of OBE Philosophy	31
6.2.2 Analysis of OBE curricula	31
6.2.3 Comparison with MSBTE Existing Curriculum	33
6.2.4 Study of NBA/AICTE/MSBTE Guidelines	35
6.2.5 Search Conference.....	37
6.2.6 Curriculum mapping	37
6.2.7 Institute Level Policies	38
6.2.8 Development of Curriculum Revision Model.....	42
6.2.9 Preparation of Action Plan	42
6.2.10 Analysis and Brain Storming at Program Level.....	45
6.2.11 Development of Vision, Mission and PEOs and Curriculum	45
6.2.12 Approval from AB, PBOS, BOS and GB	46
6.3 Curriculum Revision at a Glance	46
CHAPTER 7 MODEL COURSE CURRICULUM.....	47
7.1 Basic Information.....	47
7.2 Rationale.....	47
7.3 Course Outcomes (COs).....	48

7.4	Course Details: Theory.....	48
7.5	Course Details Practical	49
7.6	Specification Table.....	50
7.7	Question Paper Profile (QPP)	50
7.8	Assessment and Evaluation Scheme	51
7.9	Scheme of Practical Evaluation.....	53
7.10	Mapping of Course Outcomes with POs and PSOs	53
7.11	Reference & Text Books	54
7.12	E-References	54
7.13	List of Major Equipment's/Instruments with Specification	55
7.14	List of Experts & Teachers who Contributed for Curriculum	55
	CHAPTER 8 CURRICULUM DOCUMENT	56
8.1	Vision of Institute.....	56
8.2	Mission of Institute.....	56
8.3	Vision of Program	56
8.4	Mission of Program	56
8.5	Program Educational Objectives (PEOs)	57
8.6	Program Outcomes (POs).....	57
8.7	Program Specific Outcomes (PSOs)	58
8.8	Mapping of Vision, Mission, PEOs, POs, PSOs	58
8.8.1	Mapping of Vision and Mission.....	58
8.8.2	Mapping of Missionand PEOs	59

8.8.3	Mapping of PEOsand POs- PSOs	59
8.9	Identified Skills in Search Conference	59
8.9.1	Technical skills for Civil Engineering Diploma Students.....	59
8.9.2	Generic skills for Civil Engineering Diploma Holder	62
8.10	2011 Curriculum Mapping with Program Outcomes (POs).....	63
8.10.1	Identified Gaps in 2011 Curriculum.....	65
8.11	Courses Identification	66
8.12	Program Structure	69
8.12.1	Program Structure Level I: General Studies	70
8.12.2	Program Structure Level II: Basic Science Courses	71
8.12.3	Program Structure Level III: Engineering Sciences and Technical Arts Courses	72
8.12.4	Program Structure Level IV: Professional Courses	73
8.12.5	Program Structure Level IV: Professional Courses (Project Courses)	74
8.12.6	Program Structure LevelV: Elective Courses	75
8.12.7	Program Structure Level V: Elective Courses	76
8.12.8	Program Structure Abstract.....	77
8.13	Award of Class Courses	78
8.14	Curriculum at a Glance	79
8.15	Courses Flow Diagram.....	80
APPENDIX A : CURRICULUM		81

LIST OF FIGURES

Figure 1.1. Location of Nagpur City.....	3
Figure 1.2. Government Polytechnic, Nagpur Campus	4
Figure 2.1. Higher Education System in India.....	5
Figure 2.2. Classification of Higher Education System in India	6
Figure 3.1. Organizational Structure of GPN	12
Figure 3.2. Curriculum Development System	12
Figure 4.1. Outcome Based Education Framework.....	17
Figure 4.2. Key Constituents of OBE	17
Figure 5.1. Human Being and Domains of Learning.....	21
Figure 5.2. Revised cognitive hierarchy Levels.....	23
Figure 5.3. Psychomotor hierarchy Levels	24
Figure 5.4. Affective Domain hierarchy Levels	26
Figure 5.5. Program Outcomes and Domains of Learning	27
Figure 6.1. Mapping of change management tools with ADKAR	29
Figure 6.2. GoPoNa Model.....	42
Figure 7.1. Course Code	47
Figure 8.1. Courses Flow Diagram (Sample Path)	80

LIST OF TABLES

Table 4.1. Difference between Course Outcomes and Course Objectives.	20
Table 5.1. Cognitive Domain Levels Action Verbs.....	23
Table 5.2. Psychomotor Domain Levels Action Verbs	25
Table 5.3. Affective Domain Levels Action Verbs	26
Table 6.1. Credits Comparison	31
Table 6.2. Credit Ratio TH:PR Comparison.....	32
Table 6.3. Courses Comparison	32
Table 6.4. Examination Scheme Comparison.....	32
Table 6.5. Comparison of Autonomous Curricula.....	33
Table 6.6. Comparison of Existing Curriculum-2011 with MSBTE-2012 Curriculum ..	34
Table 6.7. List of Existing Courses for Revision/Deletion etc.	34
Table 6.8. List of New Courses proposed.....	34
Table 6.9. Comparison of Examination Scheme with MSBTE Curriculum.....	34
Table 6.10. Abstract of Guidelines	35
Table 6.11. Curriculum mapping (Sample)	38
Table 6.12. Suggestive Curriculum at a Glance	41
Table 6.13. First Phase Action Plan.....	43
Table 6.14. Second Phase Action Plan	44
Table 6.15. Program Structure Level I (sample).....	45

Table 7.1. Course Details Theory (sample)	49
Table 7.2. Course Details:Practical (sample).....	49
Table 7.3. Specification Table (sample)	50
Table 7.4. Question Paper Profile (sample)	51
Table 7.5. Assessment and Evaluation Scheme (Sample)	52
Table 7.6. Scheme of Practical Evaluation (Sample)	53
Table 7.7. Mapping of COs with POs and PSOs (Sample)	53
Table 7.8. Reference & Text Books (Sample).....	54
Table 8.1. Mapping of Vision-Mission.....	58
Table 8.2. Mapping Mission-PEOs.....	59
Table 8.3. Mapping PEOs-POs & PSOs.....	59
Table 8.4. 2011 Curriculum Mapping with POs & PSOs.....	63
Table 8.5. Courses Identification from Identified Skills.....	66
Table 8.6. Program Structure Level I: General Studies	70
Table 8.7. Program Structure Level II: Basic Science Courses	71
Table 8.8. Program Structure Level III: Engineering Sciences and Technical Arts Courses	72
Table 8.9. Program Structure Level IV: Professional Courses.....	73
Table 8.10. Program Structure Level IV: Professional Courses (Project Courses)	74
Table 8.11. Program Structure Level V: Elective Courses.....	75
Table 8.12. Program Structure Level V: Elective Courses.....	76
Table 8.13. Program Structure Abstract	77

Table 8.14. Award of Class Courses.....	78
Table 8.15. Curriculum at a Glance	79

CHAPTER 1

Government Polytechnic, Nagpur an Introduction

This chapter gives the history of Government Polytechnic, Nagpur.

1.1 History

The **Government Polytechnic, Nagpur** is an oldest technical institution in central India. It was founded on 14th July 1914 as the Government Engineering School. At its commencement the school had 16 students on roll and was located in the Victoria Science College (now the Institute of Science) in Nagpur. During its first year the school provided courses in Civil Engineering & Mechanical Engineering up to diploma standard. Later in 1915 Automobile Engineering Course was also established which was subsequently converted into Post Diploma in Automobile Engineering. The institution has given birth to Engineering College presently known as Visvesvaraya National Institute of Technology, Nagpur (VNIT). The school was expanding rapidly & from 16 students enrolled in 1914 increased to nearly 2000 in current year and Govt. Engineering School converted to Government Polytechnic, Nagpur.

1.2 Autonomy

The Institute has recently celebrated its Centenary year. Government Polytechnic, Nagpur has history of 102 Glorious Years. The Government Polytechnic, Nagpur is committed to contribute to through excellence in technical education, to serve as valuable resource for industry and society. The institute is always upright in responding to educational needs of its changing world's scenario.

From academic session 1995 the institute was conferred with autonomous status by Government of Maharashtra as per Government Resolution No. WBP-1093/(2640) (69)VE-5 Dated- 31st March, 1994, in context of academic matter viz. identification of

need of new programs, requisite curriculum design, implementation of self-designed curriculum, assessment, evaluation and certification of students.

1.3 Awards

Some of the prestigious awards received by Government Polytechnic, Nagpur are as follows:

- State Award “Best Overall Performance 1996” (ISTE Narsee Monjee Award)
- State Award “Best Polytechnic, 1997” , (Govt. of Maharashtra)
- National Awards “Best Polytechnic, Student Chapter 2002”,(Institute of Engineers (India))
- National Awards “Best Polytechnic, Student’s Project ,2002” (ISTE Narsee Monjee)
- State Award “Best Overall Performance 2016” (ISTE Narsee Monjee Award)
- National Education Award for “Best Technical Educational Institute in Maharashtra State-2016”

1.4 Geographical Location of Nagpur City

The latitude of Nagpur, India is 21.146633, and the longitude is 79.088860. Nagpur, India is located at India country in the Cities place category with the gps coordinates of 21° 8' 47.8788" N and 79° 5' 19.8960" E. Nagpur, India elevation is 311 meters height. Nagpur is located at the exact centre of the Indian peninsula. Figure 1.1 shows the location. The city has the Zero Mile Stone locating the geographical centre of India, which was used by the British to measure all distances within the Indian subcontinent. [Wikipedia]. The city gets its name from the river Nag, which flows through the city, originating at a small village called Lavha. It is famous for the Nagpur orange and is known as the "Orange City" for being a major trade centre of oranges cultivated in the region.



Figure 1.1. Location of Nagpur City

1.5 Government Polytechnic, Nagpur Campus

Government Polytechnic, Nagpur is situated in heart of the Nagpur City at “Sadar” area, 2.1 km walking distance from zero mile stone as well as Nagpur railway station. The campus map of GPN is shown in Fig. 1.2.



Figure 1.2. Government Polytechnic, Nagpur Campus

CHAPTER 2

Polytechnic Education System

This chapter describes the polytechnic education system in India. Various bodies responsible for polytechnic education in India are also described below.

2.1 Higher Education System in India

The aim of any country's higher education system is sustainable development and achieving higher growth rates. It is enabled through creation, transmission and dissemination of knowledge. To achieve this, India has setup a school education system and higher education system. The higher education system is one of the strongest parts of the Indian education system.

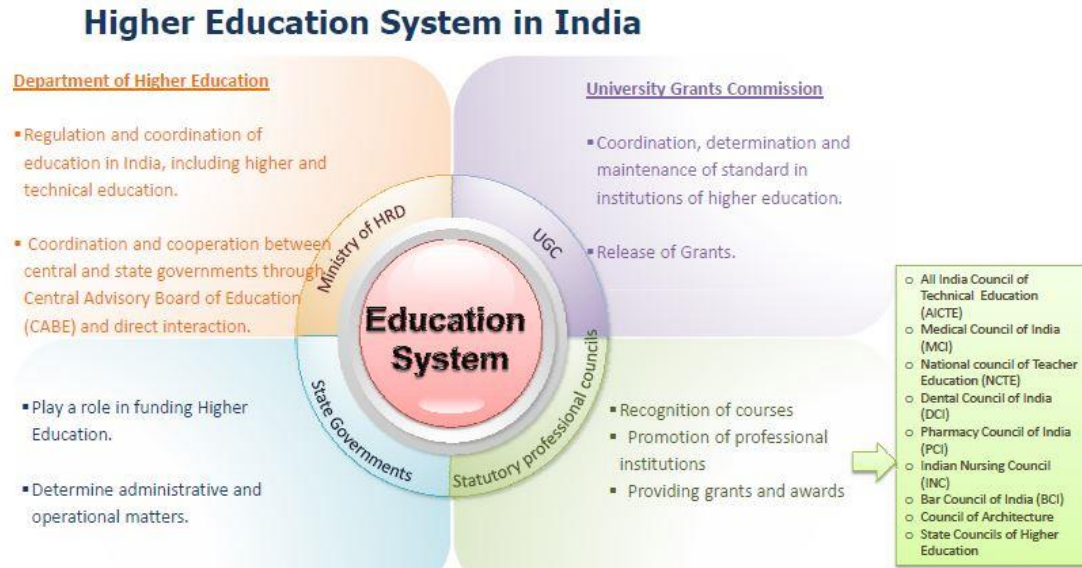


Figure 2.1. Higher Education System in India

Figure 2.1 shows the various bodies responsible for higher education in India, with their roles; as follows:

1. Ministry of Human Resource Development (HRD)

- Regulating and coordination of education in India
 - Coordination and cooperation between central government through central advisory board of education (CABE) and direct interaction
2. University Grant Commission
 - Coordination, determination and maintenance of standards in institutes of higher education
 - Release of grants
 3. State Governments
 - Funding Higher Education
 - Determine administrative and operational matters
 4. Statutory Professional Councils their roles and responsibilities.
 - Recognition of Courses
 - Promotion of Professional institutions
 - Providing grants and awards

The higher education in India is categorised in to following three categories as shown in Fig. 2.2:

1. General Education
2. Professional Education
3. Vocational Education

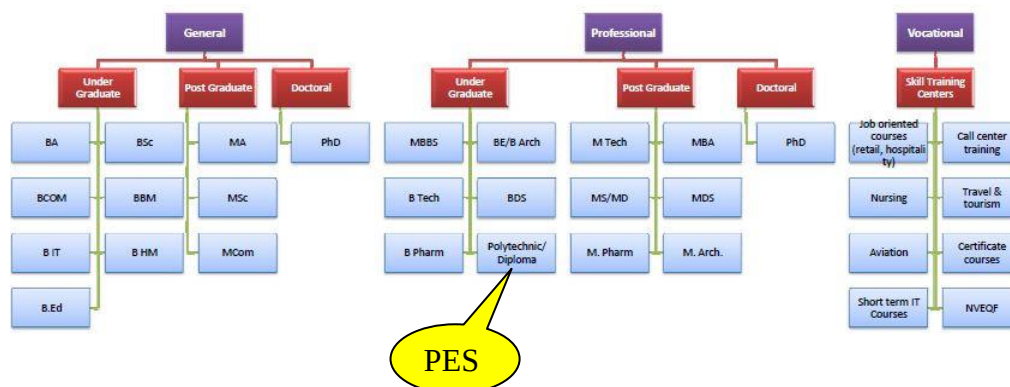


Figure 2.2. Classification of Higher Education System in India

Polytechnic Education System (PES) in India is the undergraduate level category of professional Education.

GPN is one of the autonomous polytechnic of PES in India. It is mandatory for GPN to follow the guidelines framed by the various bodies responsible for technical education, which are as follows:

2.1.1 Department of Higher Education, MHRD

The Department of Higher Education, MHRD, is responsible for the overall development of the basic infrastructure of Higher Education sector, both in terms of policy and planning in India. Under a planned development process, the Department looks after expansion of access and qualitative improvement in the Higher Education, through world class Universities, Colleges and other Institutions

2.1.2 All India Council for Technical Education (AICTE)

The All India Council for Technical Education (AICTE) has been in existence since November 1945 as a national level Apex Advisory Body. AICTE became a statutory body through an act of Parliament 52, in 1987.

AICTE was established with a view to the proper planning and co-ordinated development of the technical education system throughout the country, the promotion of qualitative improvement of such education in relation to planned quantitative growth and the regulation and proper maintenance of norms and standards in the technical education system for matters connected therewith. One of the major functions of AICTE is to lay down norms and standards for courses, curricula, physical and instructional facilities, staff pattern, staff qualifications, quality instructions, assessment and examinations.

2.1.3 National Board of Accreditation (NBA)

The National Board of Accreditation (NBA), India was initially established by AICTE (All India Council of Technical Education) under section 10(u) of AICTE act, in the year 1994, for periodic evaluations of technical institutions & programmes basis according to specified norms and standards as recommended by AICTE council.

NBA in its present form came into existence as an autonomous body with effect from 7th January 2010, with the objective of Assurance of Quality and Relevance of Education, especially of the programmes in professional and technical disciplines, i.e., Engineering and Technology, Management, Architecture, Pharmacy and Hospitality, through the mechanism of accreditation of programs offered by technical institutions.

NBA has introduced a new process, parameters and criteria for accreditation. These are in line with the best international practices and oriented to assess the outcomes of the programme. NBA adopted Outcome Based Education (OBE) model for accreditation of all engineering programs in India from 2013.

2.1.4 Higher and Technical Education, Government of Maharashtra

It is the apex authority responsible for steering and supporting the development and growth of quality Higher and Technical Education that meets educational and social objectives of the state. This department is highly committed towards inclusive education and realizes the importance of quality of education and has undertaken numerous initiatives for achieving highest quality standards in the field of education. Accreditation and Re-accreditation of the Universities and Institutes of higher learning has been made mandatory to ensure the quality of institutions.

2.1.5 Directorate of Technical Education (DTE), Government of Maharashtra

The role of the Directorate is to maintain, enhance the standard, quality of technical education by laying the policies, establishing developing Govt. Institutions, guiding supervising the aided, private institutions, interacting with industry and national level institutions, co-ordinating with other departments of State Government, Government of India Statutory Organisations and to contribute to the development of industry society at large.

2.1.6 Maharashtra State Board of Technical Education (MSBTE)

Maharashtra State Board for Technical Education (MSBTE) was established with the enactment of the Maharashtra State Board of Technical Education Act 1997 to regulate the matters pertaining to diploma level technical education in the state of Maharashtra.

According to act section 34, the autonomous institutions shall be required to obtain equivalence for their courses and programmes from the MSBTE. The MSBTE shall monitor all academic and examination related activities of the Autonomous Institutions such as curriculum, teaching examination scheme, teaching hours, academic schedule, eligibility of candidate to appear for the examination, etc.

2.2 Polytechnic Education System

Polytechnic education in India constitutes an important segment of Technical Education and contributes significantly to the economic development. Aimed at creating a vast amount of technical manpower, the polytechnics have played a vital role in providing skilled manpower at various levels for organized, unorganized and Service Sectors.

The aim of the polytechnic education is to create a pool of skill based manpower to support shop floor and field operations as a middle level link between technicians and engineers. The pass-outs of Diploma level Institutions in Engineering & Technology play an important role in managing shop-floor operations. It is further an established fact that small & medium Industry prefer to employ Diploma Holders because of their special skills in interpreting engineering, drawings, estimating, costing, billing, supervision, measurement, testing, repair & maintenance etc.

Curriculum is an educational programme designed, developed & implemented in formal educational system to achieve pre-determined & pre-stated educational objectives. Every individual social system comes in to existence as a result of need of its output emerged in its environment. Educational objectives of PES can be stated as follows:-

- a) To cater to specific manpower need in overall Technical Manpower Spectrum of industry and society that lies between craftsman on one side and technocrat on other.

- b) To cater the man power need of primary, secondary and tertiary sector of industry.
- c) To cater to individual educational need for development of self, community and society.
- d) To cater to an individual need to update him in tune with advancement in engineering and technology.

Educational objectives stated above talk about manpower with-certain task profile. To develop such task profile in an individual, which consists in general of all duties and associated tasks and sub tasks that an individual is supposed to perform, it is required to organize various experiences in different setups viz. classrooms, laboratories, workshops and fields, through out any educational programme. With such experiences it should be ensured that students acquire requisite knowledge, skills, attitudes and abilities to perform sub tasks and duties and finally job which he is likely to get after passing programme.

Hence, it is essential to design education program taking in to account predetermined objectives in the form of curriculum, then develop requisite resources viz. physical like space, equipment, and furniture etc. human, information and implement it to achieve the educational objectives.

CHAPTER 3

Curriculum Development System

This chapter describes the organization structure, curriculum development system and the various bodies responsible for the development of curriculum of GPN.

3.1 Organizational Structure of GPN

GPN, being part of PES it has been catering needs of individual, community, society and industry since last 102 years. Up to 1995 services being offered by GPN were under different status viz. university, MP DTE and MSBTE.

In 1995 the institute was conferred with autonomous status by Government of Maharashtra as per Government Resolution No. WBP-1093/(2640) (69)VE-5 Dated- 31st March, 1994, in context of academic matter viz. identification of need of new programs, requisite curriculum design, implementation of self-designed curriculum, assessment, evaluation and certification of students. In nutshell accountability regarding academic matters referred above followed by placement of students in world of work is trusted on the institute. Functional organization of students in world of work is entrusted to the institute. Functional organization parallel to hierarchical organization of institute is constituted for running institute under autonomous status effectively and efficiently. Fig. 3.1 shows the organizational structure of GPN.

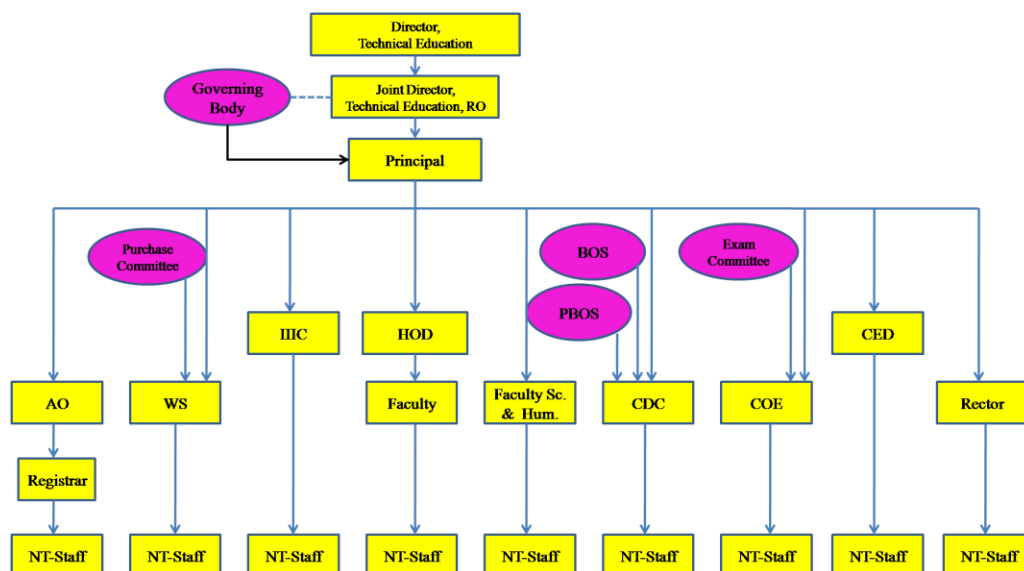


Figure 3.1. Organizational Structure of GPN

3.2 Curriculum Development System

Since, 1995 the institute has been designing/revising and implementing curricula of 11 programmes. This is being done using Curriculum Development System shown in Figure 3.2.

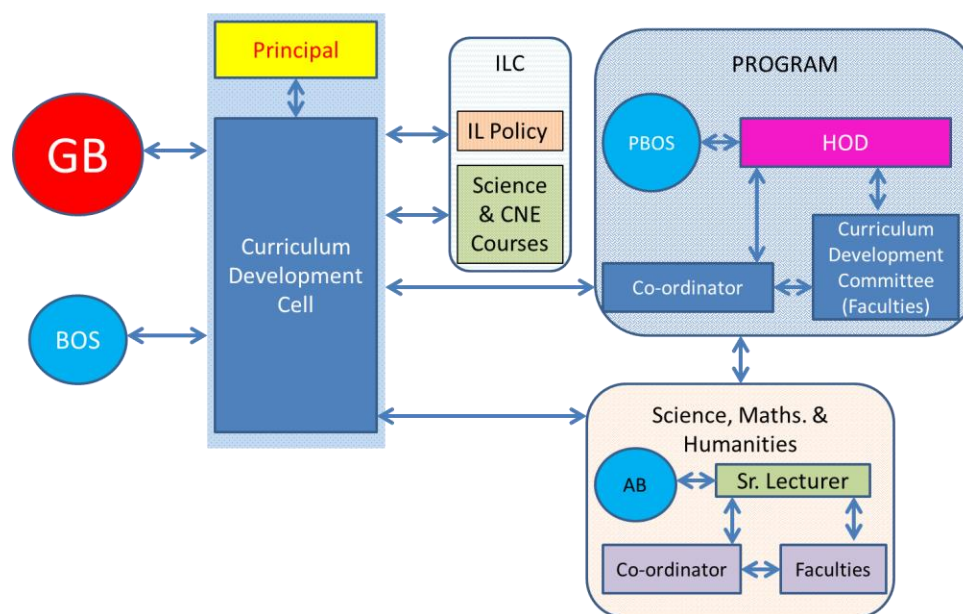


Figure 3.2. Curriculum Development System

Curriculum Development System consists of Programs (Civil, Mechanical, and Electrical etc.), Non Programme Department (Science, Maths, and Humanities), Institute Level Committee (ILC), and Curriculum Developmental Cell (CDC) headed by Principal of the Institute. Institute follows certain process in designing, revising, developing and implementing curriculum and student assessment & evaluation for enhanced students' learning. The constitutional bodies Governing Body (GB), Board of Studies (BOS) and Program wise Board of Studies (PBOS) for programs and non-constitutional body i.e. Advisory Board (AB) for Non Programme Department are responsible for approval of curriculum.

3.2.1 Governing Board (GB)

GB is an apex body. The committee members and roles and responsibilities of GB of GPN are stated below:

- **Committee Members:**

1. Joint Director of Technical Education Maharashtra State, Bombay - Chairman
2. Nominee from Western Regional Committee Govt. of India - Member
3. Regional Officer, Human Resource Development or Co-ordinator, TTTI, Pune - Member
4. Representative from the Local Centre the I.E.(India) - Member
5. Representative from the Engineering Association - Member
6. Representative from the District Industries - Member
7. Project Director, State Project Implementation Unit (World Bank) – Member
8. Principal of the Polytechnic – Member Secretary

- **Functions and Responsibilities:**

1. To decide the policy of the institute and decide guidelines of the function of various committees.
2. To analyse all issues and provide policy directive for developing the scheme and implementing it at the institute level.
3. To appoint the various committees of Governance for smooth functioning of the Institute.

4. To institute scholarships fellowships studentships, Mudat prize and certificates on the recommendation of Board of Studies.
5. Approve new programmes of studies leading to Diploma/Post-Diploma.
6. Approve modifications in present curriculum in order to meet the changed demands of the industry society from time to time.
7. Approve Annual Reports of the Institute
8. Approve Continuing Education Programmes or similar Activities Beneficial to the Students/Community Institute.
9. To approve the fees and other charges payable by the students of the Polytechnics on the recommendation of Board of Studies.

3.2.2 Board of Studies (BOS)

BOS is an Institute level committee. The committee members and roles and responsibilities of BOS of GPN are stated below:

- **Committee Members:**

1. Representative of the Industry - Chairman
2. Head of Department of 5 Programmes - Member
3. Local Experts of 5 Programmes- Member
4. Nominee of Board of Technical Examinations, M.S. Bombay- Member
5. In-charge of Curriculum Development Component– Member Secretary

- **Functions and Responsibilities:**

1. To prepare Syllabi for various courses and develop curriculum keeping in view the objectives of the Institute and the national requirement for consideration. Syllabi shall be equivalent to Syllabi of Board of Technical Examinations.
2. To suggest methodologies for innovative teaching and evaluation techniques.
3. To Co-ordinate research teaching, extension and other academic activities in the various departments/ institute.
4. To recommend books including test books for various courses of studies.

3.2.3 Program Wise Board of Studies (PBOS)

PBOS is a program level committee. GPN is having 11 PBOS committees. The committee members and roles and responsibilities of PBOS of program of GPN are stated below:

- **Committee Members:**

1. Head of the Department concerned- Chairman
2. Two Senior Lecturers- Member
3. One expert in the programme from the neighbouring institution - Member
4. Nominee from the Board of Technical Examinations Bombay - Member
5. One Expert from the local industry in each Programme – Member
6. In-charge of Curriculum Development component - Member-Secretary

- **Functions and Responsibilities:**

1. To decide Philosophy of curriculum design course wise.
2. To analyse present needs and to identify desirable changes, additions, deletions coursewise.
3. Analyse of personnel development.
4. Formation of Programme objectives.
5. Selection of contents.
6. Design of student's evaluation.
7. To decide resources required and development thereof.
8. To decide strategy of implementation.
9. Recommend equivalence for granting exemptions.

3.2.4 Advisory Board (AB)

Non Program Department (Science, Maths, and Humanities) are not having PBOS as per the Government Resolution. The AB is constituted in line with the PBOS for Non Program Department. There are 4 ABs each for Physics, Chemistry, Mathematics and English Department.

CHAPTER 4

Outcome Based Education Philosophy

Government Polytechnic, Nagpur adopted the OBE approach for curriculum design because, National Board of Accreditation (NBA) focusing on the adoption of OBE approach for all engineering programmes in India from 2013 for accreditation. Programmes to be accredited from 2013 will have to be based on OBE approach. NBA adopted Outcome based Model because, OBE is “Learner Centric” rather than “Teacher Centric”

4.1 Outcome Based Education

Outcome Based Education (OBE) is an education approach that focuses on the graduate attributes or outcomes after completing an academic programme. Outcome based approach means knowing what you want to achieve and then taking the steps to do so.

Some Benefits of OBE are-

1. More directed and coherent curriculum.
2. Graduates (students) will be more “relevant” to industry and other stakeholders.

The framework required for implementation of OBE consists of the following as shown in Figure 4.1 and consists of:

- Outcome Based Curriculum (OBC): What students should able to do?
- Outcome Based Teaching learning (OBTL): Making the students to achieve the outcomes
- Outcome Based Assessment (OBA): How to measure, what the students has achieved?

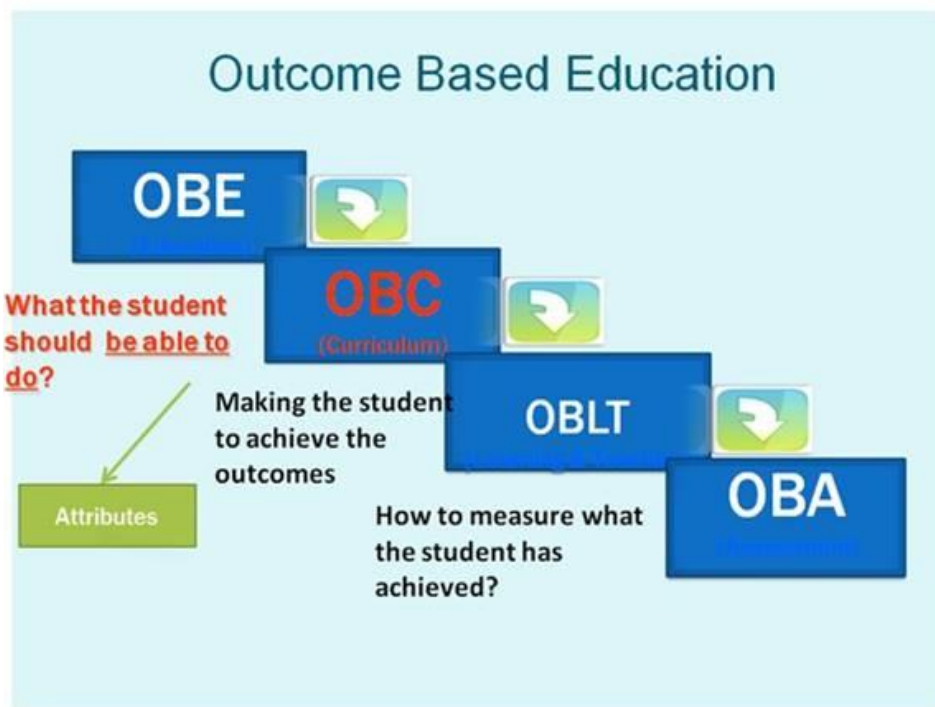


Figure 4.1. Outcome Based Education Framework

4.2 KEY constituents of OBE

Figure 4.2 shows the key constituent of OBE.

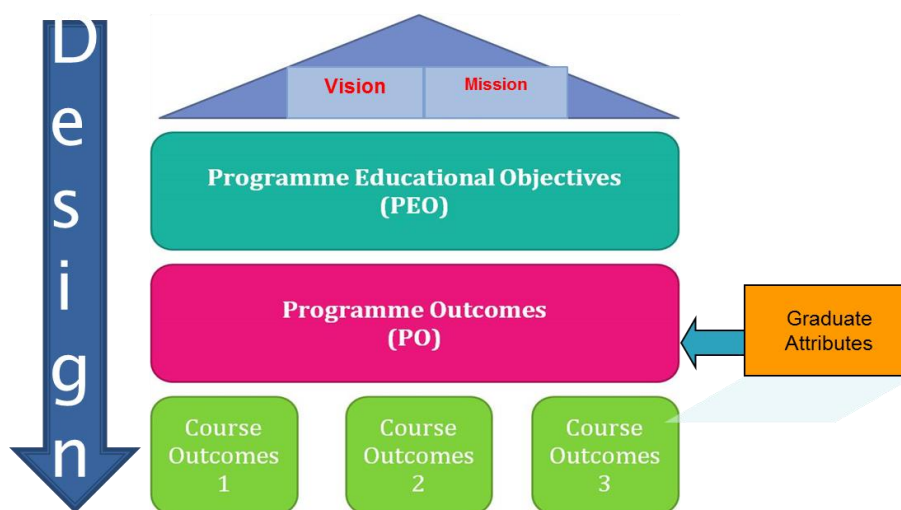


Figure 4.2. Key Constituents of OBE

4.2.1 Vision

Vision is a picture of the future you seek to create, described in the present tense, as if it were happening now. It shows where we want to go, and what we will be like when we get there.

4.2.2 Mission

Mission statement defines what an institution is, why the institution exists, and its reason for being. It defines what we are here to do together.

4.2.3 Graduate Attributes (GA's)

Graduate attributes are the qualities, skills and understandings a university community agrees its students should develop during their time with the institution. These attributes include but go beyond the disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses. WA (Washington Accord) defines 12 GA's for Engineering Graduates.

4.2.4 Program Outcomes (PO's)

Programme Outcomes (POs) describe what students should know and be able to do at the end of the programme. They are to be in line with the graduate attributes (GAs) of NBA. PO's are to be specific, measurable and achievable. POs transform the PEOs into specific student performance and behaviors that demonstrate student learning and skill development.

Following are POs (Ten) for all diploma engineering programs as per NBA guidelines-

1. **Basic Knowledge:** Ability to apply knowledge of basic Mathematics, Science and Engineering to solve the engineering problems
2. **Discipline Knowledge:** Ability to discipline specific knowledge to solve core and/or applied engineering problems
3. **Experiments and Practice:** Ability to plan and perform experiments and practices and use the results to solve engineering problems

4. **Engineering tools:** Apply appropriate technologies and tools with an understandings of limitations
5. **The Engineer and Society:** Demonstrate knowledge to assess the societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to engineering practice.
6. **Environment and Sustainability:** Understand the impact of engineering solutions in societal and environmental context, and demonstrate knowledge and need for sustainable development.
7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
8. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse/ multidisciplinary teams.
9. **Communication:** An ability to communicate effectively.
10. **Life-long learning:** Recognize the need for, and have preparation and the ability to engage in independent and life-long learning in context of technological changes.

4.2.5 Program Educational Objectives (PEO's)

The Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the programme is preparing graduates to accomplish. PEOs should be measurable, appropriate, realistic, time bound and achievable.

4.2.6 Program Specific Outcomes (PSO's)

No definition for PSO's is found in literature. According to Dr. B.L. Gupta, NITTTR, Bhopal, PSO's are the broad statements of Program specific outcomes as per the local needs.

4.2.7 Course Outcomes (CO's)

Course Outcomes (COs) are clear statements of what a student should be able to demonstrate upon completion of a course. They should be assessable and measurable knowledge, skills, abilities or attitudes that students attain by the end of the course. It

is generally a good idea to identify between four and seven. All courses in a particular programme would have their own course outcomes. These course outcomes are designed based on the requirement of the programme outcomes (POs). Each course outcomes are mapped to a relevant PO and they are mapped to the programme educational objectives (PEO). The teaching learning process and assessment methods are to be designed in such a way to achieve the COs. It is important to ensure that the student is able to acquire the knowledge or skill required. Table 4.1 clarifies the difference between Course Objectives Vs Course Outcomes

Table 4.1. Difference between Course Outcomes and Course Objectives.

Course Objectives	Course Outcomes
Describe what a teacher needs to teach, and what needs to be planned to teach.	Describe what students should demonstrate upon the completion of a course.
Example- At the end of the course, students will- Understand the types of wiring system.	Example- At the end of the course, students will be able to- Choose a suitable wiring system for particular installation.

4.2.8 Specific Learning Outcomes (SLO's) or Learning Outcomes (LO's)

Learning outcomes (LO's) or Specific Learning Outcomes (SLO's) are “*statements of what is expected that the student will be able to do as a result of learning the activity*”. (Jenkins and Unwin, 2001); i.e at the end of each unit or chapter. SLO's should also be assessable and measurable knowledge, skills, abilities or attitudes that students attain by the end of the unit

CHAPTER 5

Bloom's Taxonomy

Outcome-based education is an educational model in which curriculum and pedagogy and assessment are all focused on student learning. Learning is a relatively permanent change in behaviour potentiality that results from reinforced practice or experience. A group of educational psychologists led by Benjamin Bloom develops a taxonomy, or classification system, for learning. Some aspects of Bloom's Taxonomy is described below.

5.1 Introduction to Bloom's Taxonomy

Benjamin Bloom (1948) developed classifications of intellectual behaviour and learning in order to identify and measure progressively sophisticated learning. Bloom's taxonomy is especially important in higher education where outcomes need to address the student ability to use information, not just recall and regurgitate concepts. Lower levels of learning are easier to assess but do not adequately display what the student can do with the knowledge. However, learning is not a purely cognitive function; learning occurs differently when it entails performing a skill or re-evaluating behavior. This approach is based on biological structure of human being as shown in figure 5.1.

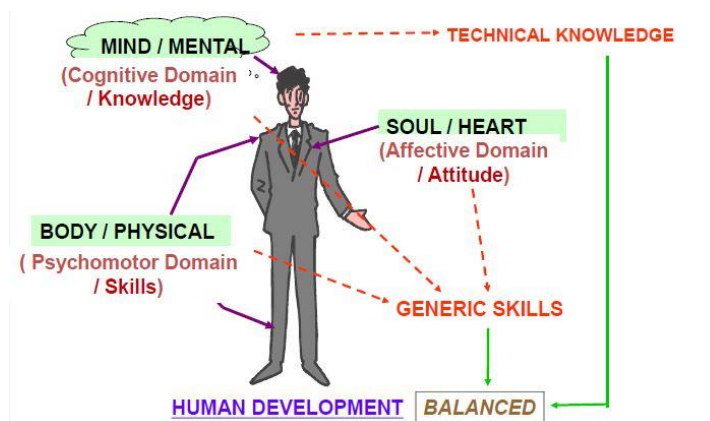


Figure 5.1. Human Being and Domains of Learning

Important elements of this approach which form basics of learning are explained below.

5.2 Domains of Learning

Learning is a process by which students develop relatively permanent change in mental associations through experience. This is how learning is defined by cognitive psychologists. Behavioral; psychologists define learning as a relatively permanent change in behavior. However, learning is not a purely cognitive function; learning occurs differently when it entails performing a skill or re-evaluating behavior.

There are following domains of learning:

- A: Cognitive Domain relates to intellectual skills or abilities
- B: Affective Domain relates to emotions, feelings, likes, dislikes etc.
- C: Psychomotor Domain relates to manipulative skills of hands, legs. Eye-hand coordination

In Engineering & Technology courses, endeavor is made to design curriculum with a focus on development of cognitive skills through classroom teaching, whereas manipulative (psychomotor) skills are developed in workshops, laboratories & seminars where students work individually or in a group. Development of affective skills attitudes and value is supposed to be acquired through projects and co-curricular activities. These are also developed from the work culture or institutions.

How far a student has developed these abilities/skills especially from cognitive and psychomotor domains is assessed on the basis of suitable examinations. When classroom and laboratory teaching is viewed in this light, evaluation becomes an integral part of teaching – learning process.

5.2.1 Cognitive Domain

Dr. Benjamin Bloom (1956) analysed questions asked in various examinations in American situation and proposed a hierarchical arrangement of instructional objectives (Intellectual abilities) tested by these questions.

The lowest level of cognitive learning achieved by a student is demonstrated by the recall of information that the student retrieves from his long term memory. So, the storage and retrieval of specific facts, concepts, principles, laws, definitions, properties, procedures etc. directly from memory was classified as a knowledge level objective. Thus questions

testing memory of students were treated as at the lowest level of the hierarchy of intellectual abilities. The other levels of hierarchy proposed by Dr. Bloom in 1956 relate to the degree of information processing required in the brain needed to provide answer to a question. The various levels in the cognitive hierarchy proposed by Dr. Bloom in 1956 and further revised in 2001 are shown in figure 5.2.

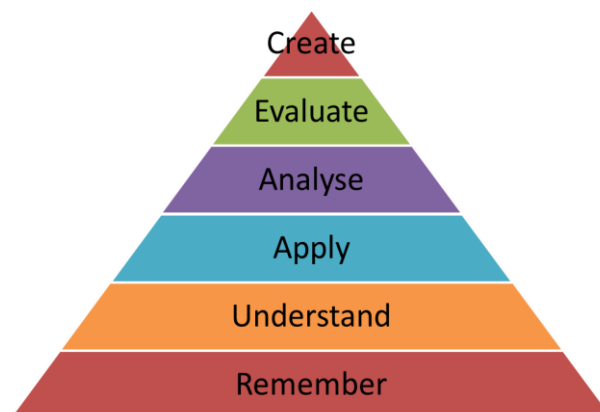


Figure 5.2. Revised cognitive hierarchy Levels

Table 5.1. Cognitive Domain Levels Action Verbs

Cognitive Domain Levels	Behavior descriptions	Action Verbs
Remember	Recall or recognize information	Define, Duplicate, List, Name, Identify, Recall, Reproduce, Recognize, Retrieve
Understand	Understand meaning, re-state data in one's own words, interpret, extrapolate, translate	Calculate, Categorize, Clarify, Classify, Compare, Conclude, Contrast, Describe, Exemplify, Expand, Illustrate, Infer, Interpret, Locate, Paraphrase, Predict, Report, Restate, Summarize, Translate
Apply	Use or apply knowledge, put theory into practice, use knowledge in response to real circumstances	Carry out, Classify, Demonstrate, Execute, Illustrate, Implement, Practice, Solve, Use, Utilize

Analyse	Interpret elements, organizational principles, structure, construction, internal relationships; quality, reliability of individual components	Appraise, Attribute, Compare, Contrast, Deconstruct, Detect, Differentiate, Discriminate, Distinguish, Examine, Formulate, Infer, Integrate, Organize, Parse, Relate, Select, Sequence, Structure, Test
Evaluate	Assess effectiveness of whole concepts, in relation to values, outputs, efficacy, viability; critical thinking, strategic comparison and review; judgment relating to external criteria	Appraise, Check, Coordinate, Critique, Defend, Detect, Dispute, Judge, Monitor, Prioritize, Rate, Reconstruct, Select, Support, Verify
Create	Develop new unique structures, systems, models, approaches, ideas; creative thinking, operations	Change, Combine, Compile, Compose, Construct, Create, Design, Formulate, Generate, Hypothesize, Improve, Invent, Plan, Predict, Produce

5.2.2 Psychomotor Domain

The Psychomotor Domain (RH Dave's version, 1970) was established to address skills development relating to the physical dimensions of accomplishing a task. Because, 'motor' skills extend beyond the originally traditionally imagined manual and physical skills, always consider using this domain, even if you think your environment is covered adequately by the Cognitive and Affective Domains. Whatever the situation, it is likely that the Psychomotor Domain is significant.

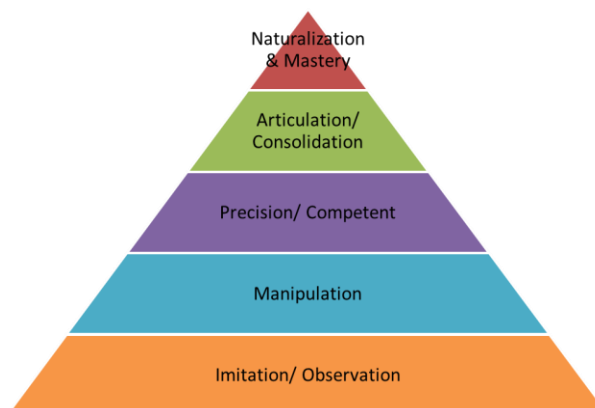


Figure 5.3. Psychomotor hierarchy Levels

Table 5.2. Psychomotor Domain Levels Action Verbs

Psychomotor Domain Levels	Behavior descriptions	Action Verbs
Imitation/ observation	Copy action of another; observe and replicate	Copy, follow, replicate, repeat, adhere, attempt, reproduce, organize, sketch, duplicate
Manipulation	Reproduce activity from instruction or memory	Re-create, build, perform, execute, implement, acquire, conduct, operate
Precision/ competent	Execute skill reliably, independent of help, activity is quick, smooth, and accurate	Demonstrate, complete, show, perfect, calibrate, control, achieve, accomplish, master, refine
Articulation/ consolidation	Adapt and integrate expertise to satisfy a new context or task	Solve, adapt, combine, coordinate, revise, integrate, adapt, develop, formulate, modify, master
Naturalization & Mastery	Instinctive, effortless, unconscious mastery of activity and related skills at strategic level	Construct, compose, create, design, specify, manage, invent, project-manage, originate

5.2.3 Affective Domain

Affective Domain, was detailed by Bloom, Krathwhol and Masia (1964, *Taxonomy of Educational Objectives: Vol. II, The Affective Domain*.) Bloom's theory advocates this structure and sequence for developing attitude - also now commonly expressed in the modern field of personal development as 'beliefs'. As with the other domains, the Affective Domain detail provides a framework for teaching, training, assessing and evaluating the effectiveness of training and lesson design and delivery, and also the retention by and affect upon the learner or trainee.

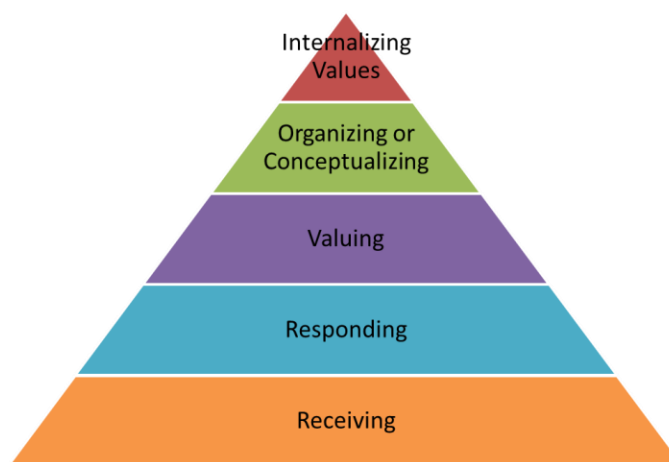


Figure 5.4. Affective Domain hierarchy Levels

Table 5.3. Affective Domain Levels Action Verbs

Affective Domain Levels	Behavior descriptions	Action Verbs
Receiving	Open to experience, willing to hear	Ask, listen, focus, attend, take part, acknowledge, hear, be open to, retain, follow, concentrate, read, do, feel
Responding	React and participate actively	React, respond, interpret, clarify, contribute, question, present, cite, write, perform
Valuing	Attach values and express personal opinions	Argue, challenge, debate, refute, confront, justify, persuade, criticize,
Organizing or Conceptualizing	Reconcile internal conflicts; develop value system	Build, develop, formulate, defend, modify, relate, prioritize, reconcile, contrast, arrange, compare
Internalizing Values	Adopt belief system and philosophy	Act, display, influence, solve, practice,

5.3 Program Outcomes and Domains of Learning

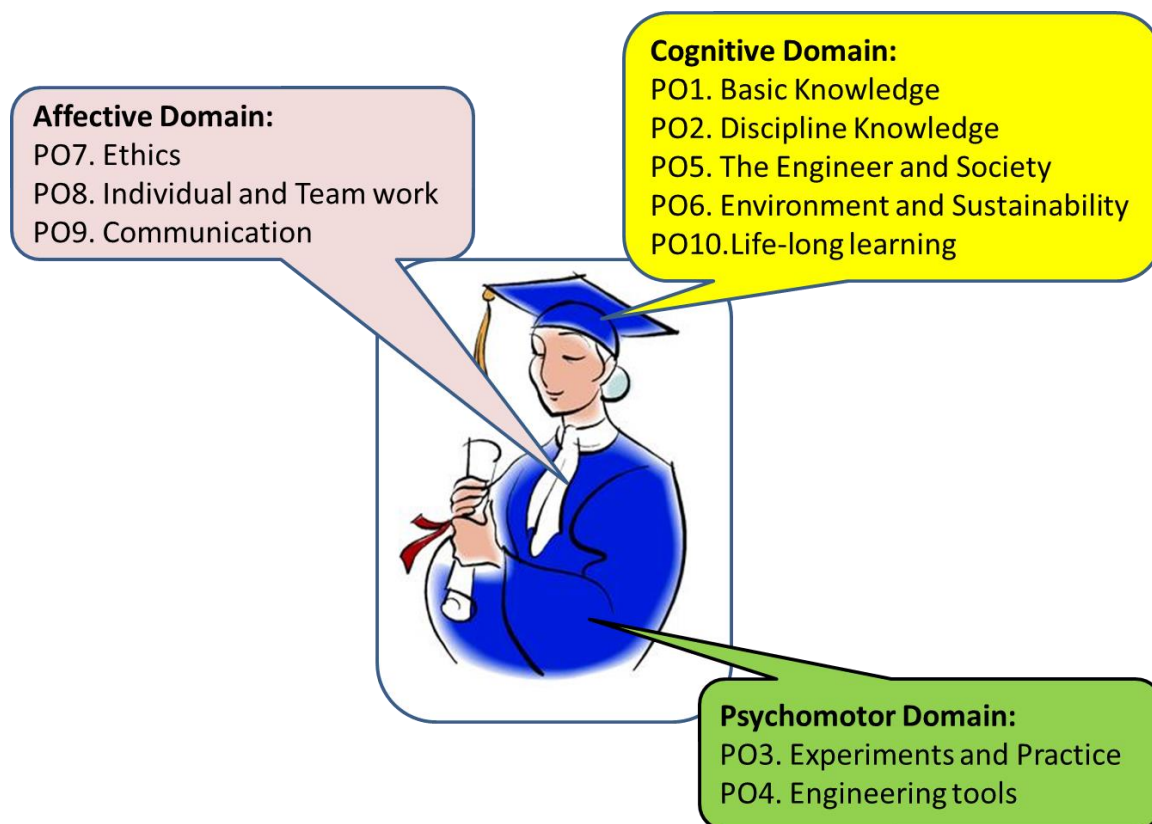


Figure 5.5. Program Outcomes and Domains of Learning

Program Outcomes (POs) framed by NBA for diploma students are the specific characteristics required by the stake holders in the students. There is definite relation between these outcomes with the three different domain of learning, which are described in figure 5.5. These classification plays major role while framing curriculum.

CHAPTER 6

Curriculum Revision Process

Since, autonomous status GPN revised curriculum after every 5 years. 2016 revision is the fifth revision. Concept of Bloom's Taxonomy is included in GPN curriculum since the beginning; however the complete model of OBE is adopted first time in the curriculum revision process. The complete curriculum revision process is described below.

6.1 Change Management

GPN is the diploma level educational institute is having total 12 diploma program, out of which 11 programs are under autonomous status. Curriculum revision of such 11 programs in a short period with the new unknown model is a huge task before CDC. It is natural reaction of human being even in the best circumstances for any change, is to resist.

GPN used ADKAR model for change management. This diagnostic tool helps our organization and our employees understand where they are in the change process. We use this tool to identify gaps in your change management process and to provide effective coaching for our faculties.

The ADKAR model is used to:

- manage faculties resistance
- help faculties transition through the change process
- create a successful action plan for curriculum development
- develop a strategy of curriculum development

6.1.1 ADKAR Model for Change Management

ADKAR has become very popular with managers and project teams because this change management model is easily applied and simple to teach to others, including executive sponsors of change. ADKAR stands for:

- **Awareness** : Awareness of the need for change
- **Desire** : Desire to participate and support the change
- **Knowledge** : Knowledge on how to change
- **Ability** : Ability to implement required skills and behaviors
- **Reinforcement** : Reinforcement to sustain the change

Following change management tools are used in curriculum revision process.

1. Communication
2. Motivation
3. Workshop
4. Resistance Management
5. Training

Figure 6.1 shows the mapping of these tools with ADKAR.

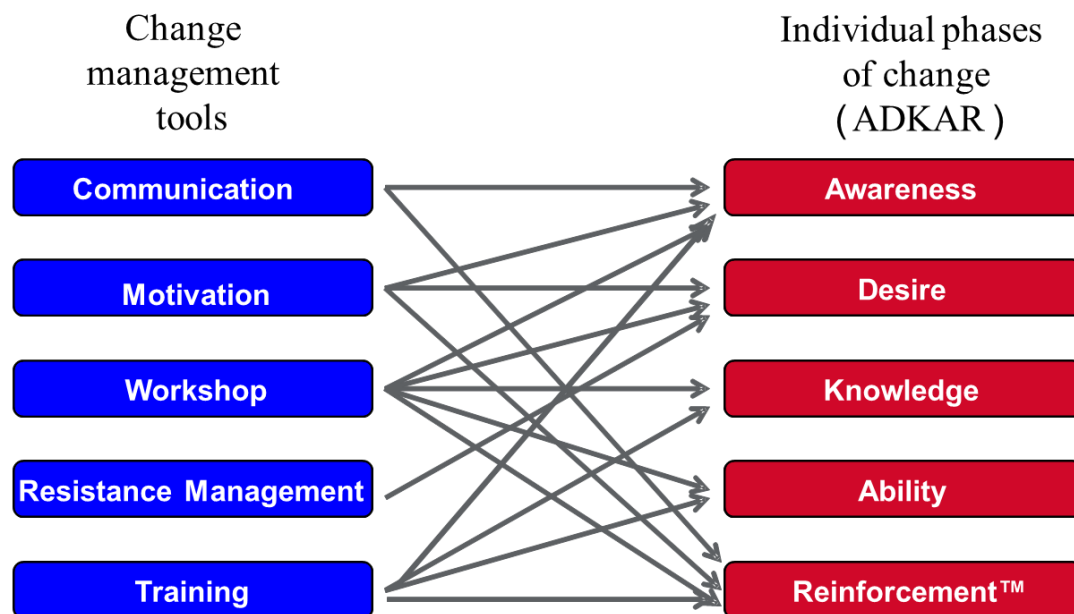


Figure 6.1. Mapping of change management tools with ADKAR

6.1.2 Results of ADKAR Model

As a result of using ADKAR model for change we got following results:

- Date of Starting curriculum Revision process :23/01/2016
- Date of Completion of curriculum Revision process :24/11/2016
- Time Period to complete curriculum Revision : 11 Months.
- No. of Programs for curriculum Revision :11
- No. of Courses for curriculum Revision : 293
- Implementation of OBE curriculum from : July 2016

6.2 Curriculum Revision Process

Following Method is adopted for Development of Curriculum

- Study Outcome Base Education Philosophy
- Analyse OBE Curricula of Diploma in Engineering in India and Autonomous Institute (MS) curricula
- Analyse Model Diploma in Engineering curriculum by AICTE
- Compare 2011 curriculum with MSBTE existing curriculum
- Study NBA/AICTE/MSBTE/NSQF guidelines
- Organize Search Conference for validation of skills
- Collect Feedback (Program-wise) on existing curriculum from stake holders
- Curriculum mapping with POs to identify curriculum gaps
- Decide Institute Level policies
- Develop Model
- Prepare Action Plan for development
- Analyse and Brain storming at program level
- Develop Vision, Mission and PEOs and curriculum at program Level (Framing, Mapping, Editing, Revising)
- Approve from PBOS, BOS and GB.

6.2.1 Study of OBE Philosophy

CDC studies the OBE philosophy, which is described previously in this document. The training of faculties are arranged for awareness of faculties.

6.2.2 Analysis of OBE curricula

Following Boards in India adopted Outcome based curriculum for Diploma in Engineering:

- Gujarat Technological University-2014-15
- Board of Technical Examinations, Bengaluru, Karnataka- 2015-16
- State Board of Technical Education, Kerala state- 2015-16
- MSBTE is going for OBE from- 2017-18

The analysis of above OBE curriculum of each and every program is a huge task; however CDC studied curriculum of Diploma in Electrical Engineering of above said boards and analyze their curriculum based on the following points.

- Credits
- Credits Ratio TH:PR
- Total Courses
- Examination Scheme
- Comparison of Autonomous Curriculum in State

The results are shown in table 6.1 to 6.5

Table 6.1. Credits Comparison

Boards	Theory Periods	Practical Periods	Credits
GTU, Ahmedabad (OBE)	95	87	182
BTE, Bengaluru (OBE)	88	108 (2Pr=1Cr)	142
SBTE, Kerala (OBE)	NA	(2Pr=1Cr)	47 per Year
MSBTE, Mumbai (G scheme)	106	93	199
AICTE Model Curriculum	90	102 (2Pr=1Cr)	145
G. P. Nagpur (2011)	113	87	200

Table 6.2. Credit Ratio TH:PR Comparison

Boards	TH:PR
GTU, Ahmedabad (OBE)	52:48
BTE, Bengaluru (OBE)	62:32
SBTE, Kerala (OBE)	70:30 (I yr)
MSBTE, Mumbai (G scheme)	53:47
AICTE Model Curriculum	64:36
G. P. Nagpur (2011)	57:43

Table 6.3. Courses Comparison

Boards	Theory Courses	Practical Courses
GTU, Ahmedabad (OBE)	28	06
BTE, Bengaluru (OBE)	22	18
SBTE, Kerala (OBE)	NA	NA
MSBTE, Mumbai (G scheme)	31	12
AICTE Model Curriculum	29	16
G. P. Nagpur (2011)	29	12

Table 6.4. Examination Scheme Comparison

Boards	Theory		Practical	
	TEE	CA	TEE	CA
GTU, Ahmedabad (OBE)	70	30	20/40	30/60
BTE, Bengaluru (OBE)	100	25	50	25
SBTE, Kerala (OBE)	100	50	50	50

MSBTE, Mumbai (G scheme)	100	25	50	25/50
AICTE Model Curriculum	70	20*+10**	50	25
G. P. Nagpur (2011)	80	20	25	25/50

*Progressive Test

** Assignments

Table 6.5. Comparison of Autonomous Curricula

Institute	TH	TU	PR	Total	Theory Papers	Practical	Total Courses
G.P. Mumbai	96	12	68	176	25	13	38
VJTI, Mumbai	92	16	86	194	27	19	46
G.P. Aurangabad	103	00	81	184	26	13	39
G.P. Kolhapur	104	00	76	180	31	10	41
G.P. Nasik	111	03	82	196	29	11	40
G.P. Nagpur	113	05	82	200	29	12	41

6.2.3 Comparison with MSBTE Existing Curriculum

As mentioned 2.1.1, autonomous institutions shall be required to obtain equivalence for their courses and programs from the MSBTE, it is essential to compare GPN curriculum with existing curriculum for variation in content, Existing Courses for Revision/Deletion, New Courses proposed, detailed Comparison of Examination Scheme. This task is performed at program level. The analysis of this task is used to decide the course outcomes, course contents as well as to finalize the program structure of revised curriculum. The formats for the same are shown in table 6.6 to 6.9.

Table 6.6. Comparison of Existing Curriculum-2011 with MSBTE-2012 Curriculum

S N	MSBTE Curriculum				Equivalent course in Autonomous Curriculum				Content Variation if any with MSBTE
	Subject Code	Name of Subject	TH Periods	PR Periods	Course Code	Name of course	TH Credits	PR Credits	

Table 6.7. List of Existing Courses for Revision/Deletion etc.

Sr. No.	Course Code	Name of Course	Write-R (Revision) NR (No Revision) D (Deletion)	Reason for R/NR/D	Name of New title if proposed

Table 6.8. List of New Courses proposed

Sr. No.	Name of new courses proposed (if any)	Reason for introduction of New courses

Table 6.9. Comparison of Examination Scheme with MSBTE Curriculum

Sr. No.	Points	MSBTE Curriculum	Autonomous Curriculum	Remarks if any
1	Theory Paper Maximum marks			
2	Practical Maximum marks			
3	Progressive Test Maximum marks			
4	Term work Maximum marks			
5	No. of subject/courses having internal practical exam.			

6	No. of subject/courses having external practical exam			
7	No. of subject/courses having internal oral exam			
8	No. of subject/courses having external oral exam			
9	No. of subject/courses having term work			
10	No. of non-exam subject/courses			
11	Industrial training included in curriculum (Yes/No)			

6.2.4 Study of NBA/AICTE/MSBTE Guidelines

The guidelines given in following documents are studied, and the final conclusions are made to framed curriculum documents.

1. Orientation Workshop on Outcome Based Accreditation NBA training text material- to frame Vision, Mission of the Institute, Vision, Mission, PEOs of the program.
2. AICTE Guidelines- 21st Academic Council Meeting of AICTE on 3rd April, 2013 to decide percentage of various level courses. The abstract of the guidelines is mentioned in the table 6.10.

Table 6.10. Abstract of Guidelines

S. N.	Levels	Percentage	Course Heads
1	General	5 to 10%	Language / Communication skills
			Humanities and Social Science
			Economics & Principle of management
			NSS, NCC, NSO, Rural Development
2	Basic Science	15 to 25%	Computer literacy with numerical analysis
			Mathematics
			Physics

			Chemistry
3	Engineering Sciences and Technical Arts	15 to 25%	Engineering Graphics
			Workshop Practice
			Engineering Mechanics
			Electrical Science I (Basic Electrical Engineering)
			Thermodynamics and Heat Transfer
			Material Science and Engineering
			Electrical Science II (Electronics and Instrumentation)
4	Professional Subjects	55 to 65%	
i)	Professional Core	22.5 to 27.5%	Minimum number of Core courses suggested by experts
ii)	Professional Elective	12.5 to 15%	About 10% Electives should be made available to the students
iii)	Free Elective	7.5 to 10%	Open interdisciplinary electives allow a student to diversify his/her spectrum of knowledge
iv)	Project	5 to 10%	
v)	Seminar & Industrial Training	2.5 to 5%	

3. MSBTE Guidelines MSBTE/D-10/Director/2012/303 Dt.1st October, 2012-

The important guidelines given by MSBE are as follows:

- Credits should not be more than 160 and should be uniform across the program
- Curriculum should be laboratory based and having more practical weightage
- Curriculum should be restricted to five levels
- 4th and 5th level courses are considered for award of diploma
- Practical Examination should be based on performance only.

- Implant training should be made compulsory any time in vacation after first year and separate credits should be given.
- Online examination of courses should be start gradually. To begin with one course per semester.

6.2.5 Search Conference

The search conference is organized at institute level on dated 12/02/2016. The experts from the industries, academic institutions and alumni were present. The main objectives of organization of search conference are as follows:

- Validate generic and technical skills identified by the program.
- Suggest new skills to be developed in a technician pertaining to specific work area by industry/ field experts.
- Collect Feedback on existing curriculum and suggestions on previous received feedback.
- Suggest new course content to be incorporated in curriculum.
- Obtain suggestions on various topics related to program structure.
- Analyze and prepare a final list of generic skills and technical skills and from courses based on validated skills later on.
- Formation of Courses

6.2.6 Curriculum mapping

The 2011 curriculum is mapped to identify Program strengths (attributes that are widely addressed) and Gaps (attributes that are addressed by only a few learning experiences).

The simplest form of curriculum map is a matrix whose rows are the learning experiences (curriculum courses) and columns are the Graduate attributes (or Program Outcomes).

The curriculum courses include General Studies Courses, Basic Science Courses, Engineering Sciences and Technical Arts Courses, Professional Courses (Core, project, seminar etc.), Elective Courses.

To establish the curriculum map, each faculty member reviews his/her courses and identifies the attributes that are addressed in the course based on its content and materials.

A sample curriculum mapping sample is shown in Table 6.10. Program wise curriculum mapping is given in subsequent chapter.

Table 6.11. Curriculum mapping (Sample)

S N	Course code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2
			Basic Knowledge	Discipline Knowledge	Experiments and Practice	Engineering tools	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Life-Long Learning	Maintain Electrical Equipment's	Maintain Electrical Power System
1	EV110 1	Environmental science	X	-	-	-	X	X	X	X	X	X	-	-
2	EE1301	Basic Electrical Engineering	X	X	X	X	-	-	X	X	X	X	X	X
3	EE1401	Electrical Circuit and Network	X	X	X	X	-	-	-	X	-	X	X	X
4	EE1402	Electrical Measurement	-	X	X	X	X	-	X	X	-	X	X	X

6.2.7 Institute Level Policies

Institute level policy for curriculum development is decided by the CDC on the basis of followings:

- OBE Model
- Analysis of various curriculum Autonomous Institute/ MSBTE curriculum/ OBE curriculum
- NBA/AICTE/MSBTE Guidelines
- Feed Back from stake holders
- Search Conference Outcomes
- Curriculum Mapping of 2011 curriculum and
- GPN 2011 Curriculum

The following institute level suggestions are forwarded to the various programs for framing program structure.

1. Levels of Courses V

- **Level I- General studies courses- 5 (5 to 10%)**
 1. English
 2. Communication Skill
 3. Environmental science
 4. Economics & Management
 5. Rural development (Non Theory)
- **Level II- Basic Science Courses- 6 (15 to 25%)**
 6. C programming (including introduction to office tools) (Non Theory) (Note: Letter on this course is changed to Computer Applications as suggested in CM/IT PBOS)
 7. Physics
 8. Chemistry
 9. Mathematics-I
 10. Mathematics-II
 11. Mathematics- III

(Note: The program which does not require mathematics-III course, may opt for more Computer literacy with numerical analysis courses. Letter on three mathematics courses are converted into two mathematics courses, by increasing the credits)
- **Level III Engineering Sciences and Technical arts courses- 7 (15 to 25%) (should be programme specific)**
 12. Engineering Graphics (Theory)
 13. Workshop Practice (program specific) (Non Theory)
 14. Electrical Science I (Basic Electrical Engineering)
 15. Electrical Science II (Electronics and Instrumentation)
 16. Material Science and Engineering (program specific)

17. Engineering Mechanics

18. Thermodynamics and Heat Transfer (or mechanical related e.g. Elements of Mechanical Engineering for EE or program specific as per the experts suggestions)

- **Level IV- i) Professional Core Courses–11- 22.5% to 27.5%**

19. to 27- Theory cum Practical Courses

28 to 29 – Practical courses (Non-Theory)

(Note: Letter on number of core courses are increased to 14)

- ii) **Project Courses- 5 to 10%**

30 to 31 – Practical Courses prerequisite for project (Non-Theory)Department specific workshop + program related design laboratory

32. Industrial Project

- iii) **Seminar and Industrial Training Courses- - 2.5 to 5%**

33. Seminar

34. Industrial Training/Practices

- **Level V- Elective Courses–11- 22.5% to 27.5%**

- i) **Professional Elective Courses- 5/8 - 12.5 to 15%**

35. to 42- Theory cum Practical Courses

(Note: Letter on number of professional electives are changed to 3/6)

- ii) **Free Elective- 7.5 to 10%**

43. Finishing School (Common for all Brach)

44 to 53. Any one Elective Course each from 10 programs

(Note: Letter on number of electives courses are changed to 1/12)

2. Detailed Curriculum Response

CDC has suggested the various responses on various criteria based on the above study and are given in table 6.12

Table 6.12. Suggestive Curriculum at a Glance

SN	CRITERION	Suggestive RESPONSE
1	Total No. of Courses in a Program	55*
2	Total courses required.	41
3	No. of courses having theory papers.	29
4	No. of courses having non Theory exam.	12
5	No. of General Studies courses	5
6	No. of Basic Science Courses	6
7	No. of Engineering Science courses	7
8	No. of Professional Core courses	11
9	No. of Professional Elective courses	5/8
10	No. of Professional Free Elective courses	2/10*
11	No. of Project courses	3
12	No. of Seminar courses	2/3
13	Total credits (1 ThHr = 1Credit& 2PrHr = 1Credit)	150-155
14	Total marks	4600 (approx.)
15	Proportion of Hours (Periods), Th : Pr	50:50 (approx.)
16	Proportion of credits, Th :Pr	65:35 (approx.)
17	Proportion of marks; Th : Pr	50:50 (approx.)
18	Total courses for Award of Class	12
19	Total theory paper courses for Award of Class	10
20	Total marks for Award of Class	1600

6.2.8 Development of Curriculum Revision Model

Top to bottom design approach model of OBE described in Figure 4.2 is found in literature. No other model is found in literature. OBE is not only top to bottom design approach; it is a 360° approach model. Based on this 360° CDC developed our own model based on the study of described above. Government Polytechnic, Nagpur model is named as GoPoNa Model. The model is as shown in figure 6.2.

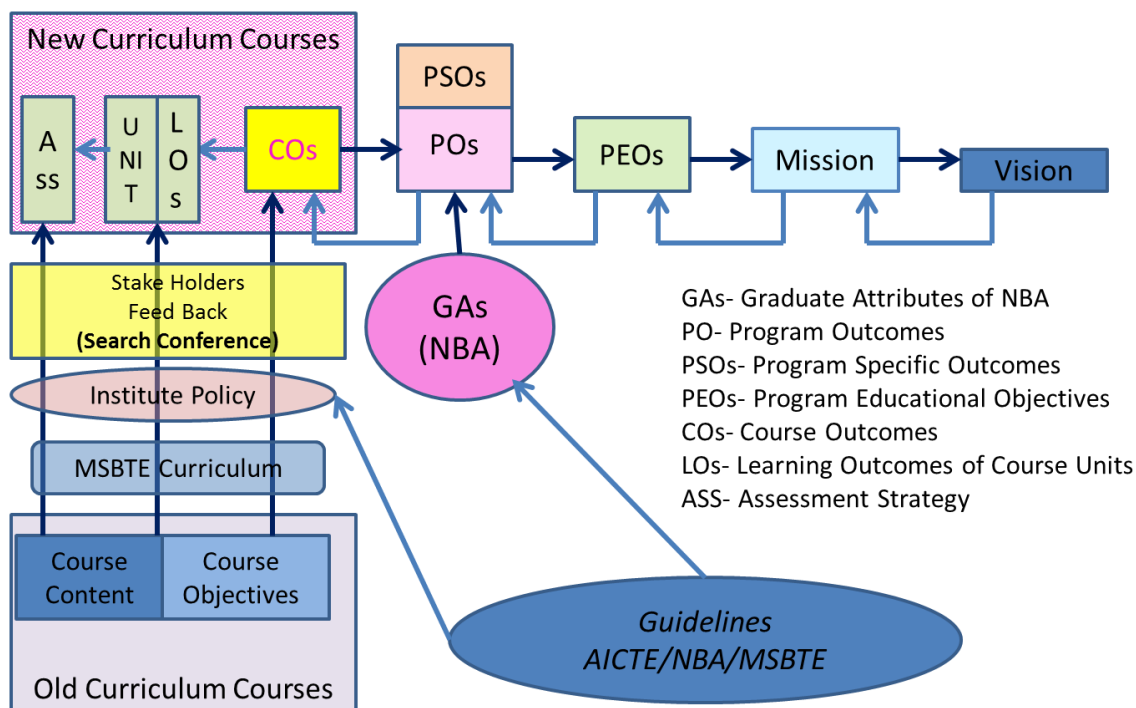


Figure 6.2. GoPoNa Model

GoPoNa Model is based on the OBE philosophy, various guidelines framed by the AICTE/NBA/MSBTE, and Search conference outcomes (feedback from stake holders). As OBE is 360° approach various feedback loops are provided in the model for continuous improvement. The model is self-explanatory.

6.2.9 Preparation of Action Plan

Due to time constraint it is decided that the curriculum development process should be divided in to two phases. In first phase Curriculum of common courses i.e. Level I, II, III

are to be develop. And in second phase program specific courses of level IV and V are to be developed. The action plan is prepared for the both phases and is shown in table 6.13 and table 6.14 respectively.

Table 6.13. First Phase Action Plan

S.N.	Activity	Period/Date of Completion, upto
1	- Formation of PBOS at departmental level - Formation of institute level committee for deciding common policies. - Formation of committee for deciding Basic Engg. , Science and CNE courses policies	31/12/2015
2	Comparison of 2011 curriculum with MSBTE curriculum (Preliminary Task)	02/01/2016
3.	Meeting for deciding common policies of outcome based curriculum at institute level.	19/01/2016
4	Meeting for deciding policies of Basic Engg. , Science and CNE courses.	19/01/2016
5	Workshop for outcome based design procedure	22/01/2016
6	Preparation of Vision, Mission statements, POs and COs at program level	01/02/2016
7	Preparation of program structure based on outcome based education (course titles, scheme etc) by all programs (first draft, based on the information/data received from industries) & submission to I/C CDC.	10/02/2016
8	Checking of first draft of program structure of all program by curriculum revision committee (CDC) and return to respective program suggesting necessary corrections if any.	17/02/2016
9	Preparation of revised draft, if required, of program structure by the program and submission to CDC.	24/02/2016
10	Search conference for Validation of skills, program structure and course content detailing by all programs at department level.	02/03/2016
11	Course Content detailing of I, II & III sem. courses strictly as per Guideline of Curriculum Revision , information obtained from industries, content detailing format , feedback of MSBTE equiv. committee etc.	11/03/2016
12	Revising program structure, course content based on the outcome of search conference(if required)	19/03/2016

13	Arranging Program-wise Board of studies meeting (PBOS) of all program for courses of all levels by respective Program.	31/03/2016
	Suggestions in PBOS if any to be incorporated for getting approval from PBOS.	
14	Submission of curriculum of I, II & III sem. courses (soft copy) by program head/ “coordinator – curriculum” of program, to I/C CDC.	07/04/2016
15	Finalizing/checking of curriculum of I, II & III sem. courses of all program by Curriculum Revision Committee & submission to respective programs.	14/04/2016
16	Presentation of curriculum structure and courses in BOS meetings.	20/04/2016
17	Presentation of curriculum structure and courses in G.B. meetings	27/04/2016

Table 6.14. Second Phase Action Plan

S.N.	Activity	Period/Date of Completion, upto
1	Course Content detailing of III (if any), IV&V Level. courses strictly as per Guideline of Curriculum Revision , information obtained from industries, content detailing format , feedback of MSBTE equiv. committee etc.	06/06/2016 to 07/08/2016
2	Revising program structure, course content based on the outcome of search conference(if required)	14/08/2016
3	Arranging Program-wise Board of studies meeting (PBOS) of all program for courses of all levels by respective Program.	Up to 24/08/2016
4	Suggestions in PBOS if any to be incorporated for getting approval from PBOS.	
5	Submission of curriculum of IV & V level courses (soft copy) by program head/ “coordinator – curriculum” of program, to I/C CDC.	31/08/2016
6	Finalizing/checking of curriculum of IV & V level courses of all program by Curriculum Revision Committee & submission to respective programs.	01/09/2016
7	Presentation of curriculum structure and courses in BOS meetings.	07/09/2016 08/09/2016
8	Presentation of curriculum structure and courses in G.B. meetings	Before Diwali Vacation

6.2.10 Analysis and Brain Storming at Program Level

As per the action plan, OBE philosophy, guidelines and outcomes of search conference faculties in the program develops the program Structure (PS) and curriculum of courses as a group task.

The draft program structure of Electrical Engineering (shown in table 6.15) and draft curriculum of Basic Electrical Engineering is developed (Described in chapter 7) by CDC as a model for development of various programs PS and curricula.

Table 6.15. Program Structure Level I (sample)

PROGRAM STRUCTURE												
Level I: General Studies												
DIPLOMA IN ELECTRICAL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	EN101E	English	Nil	03	00	02	04	70	30	50 [@]	25	175
2	EN102E	Communication Skills	Nil	03	00	02	04	70	30	50 [@]	25	175
3	MN101E	Industrial Organization & Management	Min.60 credits	04	00	00	04	70	30	Nil	Nil	100
4	EV101E	Environmental Science	Nil	01	01	00	02	70**	30	Nil	Nil	100
5	RD101E	Rural Development	Nil	00	00	02	01	Nil	Nil	50 [@]	25	75
Total				11	01	06	15	280	120	150	75	625

- Abbreviations:
TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA- Continuous Assessment
- *Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit
- Symbolic Representation
** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

6.2.11 Development of Vision, Mission and PEOs and Curriculum

Vision and Mission of the Institute is revised by the CDC in consultation with all the programs, industry experts, academic expert and alumni in search conference. Vision,

Mission, PSOs and PEOs of the programs are developed by program itself in consultation with industry experts, academic expert and alumni in search conference. Vision and Mission of the Institute is approved in BOS and PBOS and Vision, Mission, PSOs and PEOs of the programs are approved in PBOS, BOS and GB.

6.2.12 Approval from AB, PBOS, BOS and GB

Program Structure, Curriculum of Science, Maths and Humanities departments are approved in AB and program specific courses are approved in PBOS of individual departments, Science, Maths and Humanities courses are also put before the PBOS of each program for approval, the suggestions obtained in PBOS are carried out before put it to BOS and all approved courses are put before BOS for approval. The approved curricula are put before GB for final approval. Table shows the details of PBOS, BOS and GB meetings.

6.3 Curriculum Revision at a Glance

• No. of Programs	:	11
• No. of Courses	:	291
• No. of GB Meetings	:	2
• No. of BOS Meetings	:	3
• No. of PBOS Meetings	:	33
• No. of AB Meetings	:	4
• No. of ILC Meetings	:	5
• No. of SCC Meetings	:	4
• No. of Coordinators Meetings	:	5
• Trainings Workshops	:	3
• Individual Department Trainings	:	13
• Search Conference	:	1
• No. of Faculties Involved	:	108
• No. of outside Experts Involved	:	46
• Days Spent for Curriculum Editing	:	26

CHAPTER 7

Model Course Curriculum

Model Course Curriculum of Basic Electrical Engineering is framed by CDC of GPN and circulates among the programs for development of various curricula. The workshop is arranged to describe the contents in it. The details are described below.

7.1 Basic Information

Following introductory information related to course is given in each curriculum.

PROGRAMME : **DIPLOMA IN ELECTRICAL ENGG.**
LEVEL NAME : **ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES**
COURSE CODE : **EE301E**

The unique method is developed for assigning course code for the various courses, which is described in Figure 7.1.

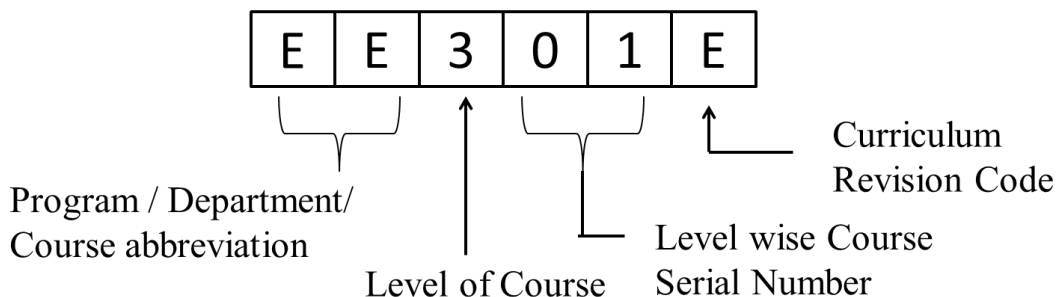


Figure 7.1. Course Code

COURSE TITLE : **BASIC ELECTRICAL ENGINEERING**
PREREQUISITE : **NIL**
TEACHING SCHEME: **TH:04; TU: 00; PR: 02(CLOCK HRs.)**
TOTAL CREDITS : **05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**
TH. TEE : **03 HRs**
PR. TEE : **02 HRs (Internal)**
PT. : **01 HR**

7.2 Rationale

In rationale the importance of the course is described in brief.

7.3 Course Outcomes (COs)

COs are “Building Blocks” of OBE system. COs are measured at the end of the course. They are aligned with one or more POs and are closely related to the assessments. COs are measurable and assessable. Every course is having six COs.

Blooms taxonomy is important in higher education, where outcomes needs to be address the student ability to use information, not just recall, therefore all course outcomes are written in higher levels of learning. COs are based on all domains of learning to fulfill maximum POs and start with the action verb. The example of CO is given below showing domains of learning. CO1, CO2 and CO3 are in cognitive domain. CO4, CO5 and CO6 are in psychomotor domain. CO3 falls also under affective domain.

1. **Apply** electrical safety concept
2. **Use** principle and basic laws in electrical engineering for different applications
3. **Solve** simple electrical circuits.
4. **Connect** electrical measuring instruments in the circuit
5. **Record** the readings of various electrical meters.
6. **Operate** electrical equipment.

7.4 Course Details: Theory

Course content is limited to six units. Each unit is having topic and subtopic. Based on the content Specific Learning Outcomes (SLOs) in cognitive Domain are mentioned. Action verbs of Cognitive Domain in all levels of learning;

1. Knowledge,
2. Comprehension,
3. Application, Analysis, Synthesis, Evaluation.

These SLOs are in line levels of learning domains mentioned in specification table or vice versa. Table 7.1 shows example.

Table 7.1. Course Details Theory (sample)

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Electrical Safety	1. Apply electrical safety rules while working 2. Remove the electrocuted person from live conductor 3. Interpret electrical safety signs and symbols 4. Apply different methods of artificial respiration on electrocuted person 5. Select fire-fighting equipment on different types of fires.	1.1 Electrical Safety, Causes of accidents, General safety rules, Concept of electrical shock, Effect of electric shock, Method of removing electrocuted person, Safety signs and symbols. 1.2 Artificial respiration-schaefer's method, silvester's method, mouth to mouth respiration. 1.3 First Aid 1.4 Fire, Causes of Fire, Basic ways of extinguishing the fire Classification of fire, Class A, B,C, D, Fire fighting equipments, fire extinguishers, and their types .	06

7.5 Course Details Practical

All Specific Learning Outcomes (SLOs) are in psychomotor domain to develop the practical skills. Table 7.2 shows example.

Table 7.2. Course Details: Practical (sample)

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Identify electrical measuring instruments, sources, ICDP/ITDP, switches, loads, wires and execute safety precautions in laboratory.	1. Electrical Safety	4
2	Connect voltmeter, ammeter and wattmeter in electrical circuit.	2. Fundamentals of electricity	2
3	Measure the current, voltage and resistance with the help of multi-meter or tong tester.		2
4	Find unknown resistance using ohms law.		2
5	Find temperature coefficient of materials.		2

Skill test is mandatory to assess the skills acquire during the course work before term end examination.

7.6 Specification Table

Specification table is a blue print for setting question paper. It is useful for designing a valid question paper. In OBE 2016 curriculum; specification table is provided for question paper setting (as well as for student); which shows the level wise cognitive process dimensions. The sample Specification table is shown on table

Table 7.3. Specification Table (sample)

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Electrical Safety	00(02)	04(00)	00(00)	04(02)
02	Fundamentals of Electricity	06(02)	08(08)	06(00)	20(10)
03	DC Circuits	02(00)	04(00)	06(06)	12(06)
04	Electrostatics	02(00)	06(04)	00(00)	08(04)
05	Magnetism and Electromagnetism	06(04)	04(08)	06(00)	16(12)
06	AC Fundamentals	02(00)	08(00)	00(06)	10(06)
	Total	18(08)	34(20)	18 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

It is suggested that for:

- Basic Courses: R=30%; U=50%; A=20%
- Higher Level Courses: R=20%; U=50%; A=30%

7.7 Question Paper Profile (QPP)

Question paper profile (QPP) is the steps to words the step of e-governance. We can generate the question paper using computer program with the help of QPP and question bank on each bit of QPP. QPP is also the ready reckoner to the setter for setting questions on different levels of cognitive domain and topics. QPP reduces the process time of printed Question Paper for Examination.

Table 7.4. Question Paper Profile (sample)

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	2	R	2																
02	2	R	4	1	U	4	2	U	4	2	U	4	2	U	4				3/5
03	5	R	4	2	U	4	3	U	4	4	U	4	5	U	4				3/5
04	5	U	4	6	U	4	6	U	4	5	U	4	5	R	4				3/5
05	4	U	6	2	A	6	3	A	6										2/3
06	3	A	6	5	A	6	6	A	6										2/3

2 Marks Bit- 5(2) = 7 Bits

4 Marks Bit- 9(6) = 15 Bits

6 Marks Bit- 4(2) = 6 Bits

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

7.8 Assessment and Evaluation Scheme

A detailed assessment and evaluation scheme is mentioned in curriculum in tabulated form as mentioned in table 7.5, which is self-explanatory.

Table 7.5. Assessment and Evaluation Scheme (Sample)

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Scripts	1, 2, 3
		Class Room Assignments		Assignments	10	--	Assignment Book	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Scripts	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	20	--	Practical Answer Scripts	4,5,6
		Journal Writing		Assignments	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course Survey			End Of The Course	Questionnaires			

7.9 Scheme of Practical Evaluation

A detailed scheme of practical evaluation is mentioned in curriculum having practical examination in tabulated form, which is a guideline for development of rubrics for assessment purpose. A sample scheme of practical evaluation of EE301E is shown in table 7.6.

Table 7.6. Scheme of Practical Evaluation (Sample)

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment's. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva voce	10
	TOTAL	50

7.10 Mapping of Course Outcomes with POs and PSOs

All developed curricula are mapped with POs and PSOs of the program. The POs and PSOs which fulfilled by the curriculum content are identified first. Individual course outcomes written previously are then mapped with the POs and PSOs. A sample mapping of EE301E is shown in table 7.7.

Table 7.7. Mapping of COs with POs and PSOs (Sample)

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	-	-	-	-	1	-	-	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	3	3
CO4	3	3	2	2	-	-	-	2	2	2	3	3
CO5	3	3	2	2	-	-	-	2	2	2	3	3
CO6	3	3	2	2	-	-	-	2	2	2	3	3

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

7.11 Reference & Text Books

A reference and text books required as per the content of curriculum are mentioned as a reference for the student as well as faculties. Only standard books having ISBN numbers are given priority in the document. A sample of EE301E is shown in table 7.8.

Table 7.8. Reference & Text Books (Sample)

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Principle of Electrical Engineering and Electronics	V.K.Mehta, S.Chand& Company Ltd., Reprint, 1996	81-219-1053-6
2.	A Text Book Of Electrical Technology Vol-I	B.L.Theraja, A.K.Theraja, S.Chand& Co Ltd., Reprint,2006	81-219-2440-5
3.	Basic Electrical Engineering	V.N.Mittle, Arvind Mittal, The McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 978-0-07-059357-2
4.	Experiments in Basic Electrical Engineering	S.K.Bhattacharya and K.M.Rastogi., New Age International Publisher, Reprint, 2009.	978-81-224-1042-6
5.	A Text Book on laboratory courses in Electrical Engineering	S.G.Tarnekar and P.K.Kharbanda, S.Chand& Company Ltd., Third, 1990	13: 978-8121901048

7.12 E-References

E-references as per the content of curriculum are mentioned as a reference for the student as well as faculties. Standard e-references are given priority in the document. These references are useful for students learning. A sample of EE301E is shown below.

- <http://nptel.ac.in/courses/108108076/1> , assessed on 18th January 2016
- <http://www.electrical4u.com> , assessed on 18th January 2016
- <https://www.youtube.com/watch?v=A9KSGAnjo2U>, assessed on 18th January 2016

7.13 List of Major Equipment's/Instruments with Specification

The list of major equipment's/ instruments required for performing the practical to developed psychomotor skills is mentioned in the document. A sample list of EE301E is shown below.

1. Ammeter MI 0-5-10 A
2. Voltmeter MI 0-150-300 V
3. Wattmeter 0-3000 W
4. Digital Multi-meter
5. Rheostat assorted sizes
6. Variable Inductor

7.14 List of Experts & Teachers who Contributed for Curriculum

The list of experts & teachers who contributed for curriculum is mentioned in the document followed by the signature of chairman PBOS and member secretary of PBOS for the authenticity of the curriculum.

S.N.	Name	Designation	Institute / Industry
1.			
2.			

 Sign. _____
 (Member Secretary PBOS)

 Sign. _____
 (Chairman PBOS)

CHAPTER 8

Curriculum Document

Detailed curriculum document of Diploma in **Civil Engineering** is given below.

8.1 Vision of Institute

To become a Center of Excellence, providing quality technical education and training

8.2 Mission of Institute

The mission of Government Polytechnic, Nagpur is-

1. To frame institutional policies for effective implementation of teaching learning process
2. To inculcate values and ethics for life-long learning through curricular, co-curricular and extra-curricular activities
3. To develop facilities and services for academic excellence
4. To enhance the skills of faculties and staff through industry institute collaboration.

8.3 Vision of Program

Vision of the Civil Engineering Program:

To impart knowledge and excellence in civil engineering and technology with global perspectives to our students and to make them ethically strong engineers to build our nation.

8.4 Mission of Program

Mission of the Civil Engineering Program:

- M1:** To produce civil engineers of high calibre, technical skills and ethical values to serve the Society and nation.
- M2:** To create competent professionals who are trained in the design, estimate, and development of civil engineering systems.

- M3.** To promote innovative and original thinking in the minds of budding engineers to face the challenges of future.
- M4.** To provide essential knowledge & skill to the students and enhance their Employable potential and entrepreneurial capabilities

8.5 Program Educational Objectives (PEOs)

The Program Educational Objectives of (PEOs) Civil Engineering Program are:

- PEO1.** To create civil engineering professionals ready for industry, government or other Organizations by implementing efficient civil engineering practices.
- PEO2.** To make use of formal and informal learning opportunities to sustain and improve technical, personal and professional growth and get various licensure
- PEO3.** To develop professional skills and by using modern tools in civil engineering
- PEO4.** To relate broad civil engineering education for effective communication of civil engineering concepts orally and in written forms.
- PEO5.** To guide principles of sustainable development and to promote the students for continuous learning and development with professional moral and ethical values.

8.6 Program Outcomes (POs)

- PO1: Basic Knowledge:** Ability to apply knowledge of basic Mathematics, Science and Engineering to solve the engineering problems
- PO2: Discipline Knowledge:** Ability to discipline specific knowledge to solve core and/or applied engineering problems
- PO3: Experiments and Practice:** Ability to plan and perform experiments and practices and use the results to solve engineering problems
- PO4: Engineering tools:** Apply appropriate technologies and tools with an understandings of limitations

PO5: The Engineer and Society: Demonstrate knowledge to assess the societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to engineering practice.

PO6: Environment and Sustainability: Understand the impact of engineering solutions in societal and environmental context, and demonstrate knowledge and need for sustainable development.

PO7: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO8: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse/ multidisciplinary teams.

PO9: Communication: An ability to communicate effectively.

PO10: Life-long learning: Recognise the need for, and have preparation and the ability to engage in independent and life-long learning in context of technological changes.

8.7 Program Specific Outcomes (PSOs)

PSO1: Construct, and maintain roads, bridges, irrigation structures and buildings.

PSO2: Use appropriate techniques to test the civil engineering materials.

8.8 Mapping of Vision, Mission, PEOs, POs, PSOs

8.8.1 Mapping of Vision and Mission

Table 8.1. Mapping of Vision-Mission

	Mission Statements			
	M1	M2	M3	M4
Vision Statement	✓	✓	✓	✓

8.8.2 Mapping of Mission and PEOs

Table 8.2. Mapping Mission-PEOs

Mission Statements	Program Educational Objectives (PEOs)				
	PEO1	PEO2	PEO3	PEO4	PEO5
M 1	✓	✓	✓	✓	✓
M 2	✓	✓	✓	✓	-
M 3	✓	-	✓	-	✓
M 4	✓	✓	✓	✓	✓

8.8.3 Mapping of PEOs and POs- PSOs

Table 8.3. Mapping PEOs-POs & PSOs

PEOs	Program Outcomes (POs)										PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO 1	PSO 2
PEO1	✓		✓	✓							✓	✓
PEO2		✓	✓	✓		✓	✓		✓	✓	✓	✓
PEO3			✓	✓						✓	✓	✓
PEO4								✓	✓			
PEO5							✓			✓		

8.9 Identified Skills in Search Conference

8.9.1 Technical skills for Civil Engineering Diploma Students

- 1 Develop awareness regarding Environment to ensure better Quality of Life.
- 2 Follow safety precautions During Natural Disaster like Earthquake, Flood, Chemical decay of materials etc.
- 3 Analyze the Statically determinate and indeterminate Structures using various Principles of Mechanics.
- 4 Develop working Drawings of Building; Read and Interpret Local Building Bye Laws.

- 5 Develop 2D Civil Engineering Drawings through AutoCAD and other softwares
- 6 Interpret various Civil Engineering Drawings for execution of Construction
- 7 Prepare survey maps for given area using appropriate surveying instruments
- 8 Use Total Station for Civil Survey
- 9 Conduct tests for Various Building Materials like Bricks , Stone , Steel , wood etc
- 10 Conduct tests for physical Properties of Cement.
- 11 Evaluate the quality of various Building Materials
- 12 Use various Building Materials for constructing safe and economical structures including Market Survey
- 13 Execute Construction procedure of various Civil Engineering Structures in accordance to the given drawing and specifications
- 14 Dispose of hazardous Waste Materials and Debris at Construction site properly
- 15 Compute properties of flowing water through Pipes and Open Channel to supply required quantity of water.
- 16 Maintain various irrigation structures like Canals, Dams, Culverts, Notches and Weirs
- 17 Supervise construction and maintenance of Roads , Buildings and Bridges
- 18 Perform tests for physical Properties of Bitumen and Highway Materials
- 19 Supervise construction and maintenance of Railway Tracks
- 20 Work out the Quantity of various Items of Civil Engineering Structures
- 21 Compute Estimated Cost of Civil Engineering Structures as per Drawings
- 22 Evaluate the Market Price of existing Residential Building
- 23 Plan the Construction Schedule, Control and Manage the works
- 24 Ensure safety during Construction
- 25 Manage Materials, Labor and Equipments for optimum use.
- 26 Carry out inspection and use Statistical Tools to ensure Quality Control
- 27 Develop Water supply system for community
- 28 Supervise plumbing and sanitation system for residential and commercial Buildings
- 29 Perform Tests of Raw Water and Waste Water
- 30 Develop Waste water disposal system.
- 31 Perform Test for Foundation Soil of construction Project as per IS provisions
- 32 Design RCC structural elements using IS 456-2001

- 33 Interpret and Draw RCC Structural Drawing using IS 456-2001 , IS 13920 and SP -34
- 34 Design Simple Steel structural elements using IS 800-2007
- 35 Interpret and Draw Steel Structural Drawings
- 36 Design concrete mix for the Civil Engineering Structures
- 37 Conduct test of concrete , coarse and fine aggregate
- 38 Develop awareness for storage and optimal use of ground and rain water resource.
- 39 Create awareness regarding using and operating advanced plants and equipment for mega structures
- 40 Perform non destructive test for concrete
- 41 Resolve disputes/conflicts at site
- 42 Ensure Labor welfare
- 43 Apply Cost Effective measures
- 44 Apply the Principles for starting of enterprise
- 45 Read and Interpret SOR for current market price.
- 46 Use the Application of Machines/Equipment such as Mixer, Vibrator, Crane, Truck Mixer, Pumps, Batch Plant etc
- 47 Understand the meaning of Terms/Terminology Used in Civil Engineering
- 48 Select appropriate code of practice used in civil engineering
- 49 Install and commissioning of precast structural elements
- 50 Appreciate the civil engineering site requirements
- 51 Recycle and reuse of materials
- 52 Basic knowledge of MS office
- 53 Prepare tender documents & comparative statements
- 54 Prepare sustainable development plan for rural development.
- 55 Analyze statically determinate and indeterminate structures using various principles of mechanics.
- 56 Calculate slope and deflection in beams
- 57 Draw shear and bending stress distribution diagram for chimney and dams.
- 58 Perform various tests on soil to asses it's bearing capacity and check suitability for foundation.

- 59 Evaluate various engineering properties of soil in laboratory as per the standard method given in IS codes.
- 60 Investigate, plan and design of new road.
- 61 Work as a group leader and as a team member to achieve set target.
- 62 Maintain inventory, filing system, indexing system of drawing/ documents and technical library references
- 63 Lead group discussion and conduct meetings of group members.
- 64 Use all resources like media, market survey, technical literature etc to gather information for selecting appropriate material, method and taking decision.
- 65 Prepare detailed project proposal and reports for indentified product, services, task, project activity.
- 66 Choose appropriate method and techniques for repairs & maintenance.
- 67 Selection of different materials for repairs of defects
- 68 Supervise construction & maintenance of structures
- 69 Carry out inspection to identify failure of structure
- 70 Maintain civil Engineering structures
- 71 Calculate stress ,strain, identify Beam structure, specify the different forces, mention different trusses.

8.9.2 Generic skills for Civil Engineering Diploma Holder

- 1 Communicate effectively in English in oral and written form with superiors, subordinates and peers
- 2 Manage people at work
- 3. Work as a group leader & as a team member to achieve goals maintain inventory filing system, indexing system of drawings/documents and technical reference libraries
- 4. Lead group discussions and meetings independently
- 5 Use all resources like media, market survey, technical literature etc. to gather information for taking decisions.
- 6 Prepare detailed project proposals and reports for identified products/services
- 7 To coordinate with service providers for services like electrical installation and wiring, lift, fire fighting, solar water heaters etc.

8.10 2011 Curriculum Mapping with Program Outcomes (POs)

The 2011 curriculum is mapped to identify Program strengths (attributes that are widely addressed) and Gaps (attributes that are addressed by only a few learning experiences). The mapping table is shown below.

Table 8.4. 2011 Curriculum Mapping with POs & PSOs

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
		Basic Knowledge	Discipline Knowledge	Experiments and Practice	Engineering tools	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Life-Long Learning	Construct & Maint. Structures	Use techniques to test Materials
EN1101	English	X	-	X	-	-	-	-	X	X	X	-	-
EN1102	Communication skills	X	-	X	-	-	-	-	X	X	X	-	-
IT1101	IT Applications	X	-	X	X	-	-	-	X	X	X	-	-
CE1101	Construction Management	-	X	X	-	X	-	X	X	X	-	X	-
EV1101	Environmental Science	X	-	-	-	X	X	X	X	X	X	-	-
PH1201	Engineering Physics	X	-	X	X	-	-	-	X	-	X	-	-
CH1201	Engineering Chemistry	X	-	X	-	-	-	-	X	-	X	-	-
MH1201	Basic Engineering Mathematics	X	-	X	-	-	-	-	X	-	X	-	-
MH1202	Engineering Mathematics	X	-	X	-	-	-	-	X	-	X	-	-
MH1203	Applied Mathematics	X	-	X	-	-	-	-	X	-	X	-	-
AM1301	Engineering Mechanics	-	X	X	X	X	X	X	X	X	X	X	X
WS1301	Workshop Practice	X	-	X	X	-	-	X	X	X	X	-	-
ME1301	Engineering Graphics	X	X	X	X	-	-	X	X	X	X	-	-

CE1301	Building Drawing	X	-	X	X	-	-	X	X	X	X	X	-
CM1308	C-Programming	X	-	X	X	-	-	-	X	-	X	-	-
CE1302	Construction Materials	X	-	X	-	-	-	-	X	X	X	X	-
AM1302	Strength Of Materials	X	X	X	X	-	-	-	X	X	X	X	X
AM1303	Mechanics of Structures	X	X	X	X	-	-	-	X	X	X	X	X
AM1304	Concrete Technology	X	X	X	X	-	-	-	X	X	X	X	X
CE1303	Basic Surveying	X	-	X	X	-	-	-	X	X	X	X	-
CE1304	Advanced Surveying	-	X	X	X	-	-	-	X	X	X	X	-
AM1305	Theory of Structures	-	X	-	-	-	-	X	-	X	X	-	-
AM1306	Soil Mechanics	X	X	X	X	-	-	-	X	X	X	X	X
CE1305	Building Construction	X	-	X	X	X	-	X	X	X	X	X	-
CE1306	Application of CAD	-	X	X	X	-	-	-	X	X	X	X	-
CE1307	Hydraulics	-	X	X	-	-	-	-	X	X	-	X	-
CE1401	Estimating & Costing	-	X	X	-	X	-	X	X	X	-	X	-
CE1402	Highway Engineering	-	X	X	X	-	-	-	X	X	X	X	-
CE1403	Transportation Engineering	-	X	X	X	-	-	-	X	-	X	X	-
CE1404	Water Resources Engineering	-	X	X	-	-	-	-	X	X	X	X	-
CE1405	Contracts, Accounts & Valuation	-	X	X	-	X	-	-	X	X	X	X	-
CE1406	Environmental Engineering	-	X	X	X	-	X	-	X	X	X	X	X
CE1407	Building Services	-	X	-	-	X	-	-	X	X	X	X	X
AM1401	Design of Steel Structures	-	X	X	X	X	-	X	X	X	X	-	-

AM1402	Design of Reinforced Cement Concrete Structures	-	X	X	X	X	-	X	X	X	X	-	-
CE1408	Seminar	-	X	-	X	X	-	X	X	X	X	X	-
CE1409	Project (Civil)	-	X	X	X	X	X	X	X	X	X	X	-
AM1403	Project (Structure)	-	X	X	X	X	X	X	X	X	X	X	X
AM1503	Advanced Concrete Technology	-	X	X	X	X	-	X	X	X	X	-	-
CE1501	Advanced Construction Equipment	-	X	X	X	-	X	-	-	X	X	X	-
CE1502	Maintenance & Rehabilitation of Structures	X	X	-	X	X	X	X	X	X	-	X	-

8.10.1 Identified Gaps in 2011 Curriculum

2011 curriculum mapping with Program Outcomes (POs) and Program Specific Outcomes (PSOs) are carried out. It is found that, the content in 2011 curriculum related to following POs are less related to other POs.

1. PO4:Engineering Tools
2. PO5: The Engineer and Society
3. PO6: Environment & Sustainability
4. PO7: Ethics
5. PO9: Communication

Therefore, to fulfill these gaps some common courses and program specific courses are suggested in curriculum

Common Courses:

1. Rural Development
2. Finishing school
3. Industrial Training / Industrial practices

4. Free Electives (Total twelve courses)

Program related courses:

1. Low Cost Housing
2. Advanced Structural Analysis

8.11 Courses Identification

Courses are formed based on identified skills in search conference, identified gaps in 2011 curriculum, AICTE guidelines and institute policy framed by ILC. The following table shows the identified skills and courses formed based on it.

Table 8.5. Courses Identification from Identified Skills

Identified Skills	Courses
Common Course to fulfill PO1 and PO9	English
Common Course to fulfill PO1 and PO9	Communication skills
G2 Manage people at workSet up construction site organization. G3 Work as a group leader & as a team member to achieve goals maintain inventory filing system, T23 Plan the Construction Schedule, Control and Manage the works T25 Manage Materials, Labor and Equipments for optimum use. T26 Carry out inspection and apply Quality Control measures T41 Resolve disputes/conflicts at site T42 Ensure Labor welfare	Construction Management
T1Develop awareness regarding Environment to ensure better Quality of Life. T2 Follow safety precautions during Natural Disaster like Earthquake, Flood, Chemical decay of materials etc	Environment Science
T54Prepare sustainable development plan for rural development.	Rural Development
T45 Basic Knowledge of MS office	Computer Application
Common Course to fulfill PO1	Engineering Physics
Common Course to fulfill PO1	Applied Chemistry
Common Course to fulfill PO1	Engineering Mathematics
Common Course to fulfill PO1	Applied Mathematics
Common Course to fulfill PO1	Engineering Graphics

Common Course to fulfill PO1, PO3, PO4	Workshop Practice
T71 Calculate stress ,strain, identify Beam structure, specify the different forces, mention different trusses	Engineering Mechanics
T7 Prepare survey maps for given area using appropriate surveying instruments.	Basic Surveying
T4 Develop working drawing of building; Read and Interpret local building bye laws. T6 Interpret various Civil Engineering Drawings for execution of Construction.	Building Drawing
T12 Use various Building Materials for constructing safe and economical structures including Market Survey	Construction Materials
T3 Analyze statically determinate structures using equations of equilibrium.	Strength of Materials
T55 Analyze statically determinate and indeterminate structures using various principles of mechanics. T56 Calculate slope and deflection in beams T57 Draw shear and bending stress distribution diagram for chimney and dams.	Theory of Structure
T58 Perform various tests on soil to assess its bearing capacity and check suitability for foundation. T59 Evaluate various engineering properties of soil in laboratory as per the standard method given in IS codes	Geotechnical Engineering
T10 Conduct tests for physical properties of cement. T37 Conduct test of concrete, coarse and fine aggregate. T36 Design concrete mix for the civil engineering structures.	Concrete Technology
T32 Design RCC structural elements as per IS 456-2001.	Design of RCC Structures
T33 Interpret and draw RCC structural drawings as per IS 456-2000, IS 13920-1993 SP 34.	
T34 Design simple steel structural elements as per IS 800-2007. T35 Interpret and draw steel structural drawings as per IS 800-2007.	Design of Steel Structures
T8 Use Total Station for Civil Survey.	Advanced Surveying
T47 Understand the meaning of terms, terminology used in Civil Engineering T13 Execute construction procedure of various civil Engineering structures in accordance to the given drawing and specifications. T24 Ensure safety during construction.	Building Construction
T15 Compute properties of flowing water through pipes and open channel to supply required quantity of water	Hydraulics

T21 Compute Estimated Cost of Civil Engineering Structures as per Drawing	Estimating and costing
T17 Supervise construction and maintenance of Roads , Buildings and Bridges T18 Perform tests for physical Properties of Bitumen and Highway Materials T19 Supervise construction and maintenance of Railway Tracks	Transportation Engineering
T16 Maintain various irrigation structures like Canals, Dams, Culverts, Notches and Weirs T38 Develop awareness for storage and optimal use of ground and rain water resource	Water Resources Engineering
T27 Develop Water supply system for community T29 Perform Tests of Raw Water and Waste Water T30 Develop Waste Water disposal system	Environmental Engineering
T28 Supervise plumbing and sanitation system for residential and commercial Buildings	Building Services
T53 Prepare Tender documents and comparative statements T45 Read and Interpret SOR for current market price	Contracts Accounts and Valuation
T60 Investigate, plan and design of new road.	Road Project
T5 Develop 2D Civil Engineering Drawings through AutoCAD and other software	Application of CAD
T61 Work as a group leader and as a team member to achieve set target. T62 Maintain inventory, filing system, indexing system of drawing/ documents and technical library references. T63 Lead group discussion and conduct meetings of group members. T64 Use all resources like media, market survey, technical literature etc to gather information for selecting appropriate material, method and taking decision. T65 Prepare detailed project proposal and reports for identified product, services, task, project activity.	Industrial Project (Civil)
T61 Work as a group leader and as a team member to achieve set target. T62 Maintain inventory, filing system, indexing system of drawing/ documents and technical library references. T63 Lead group discussion and conduct meetings of group members. T64 Use all resources like media, market survey, technical literature etc to gather information for selecting appropriate material, method and taking decision. T65 Prepare detailed project proposal and reports for identified	Industrial Project (Structures)

product, services, task, and project activity.	
Common Course to fulfill POs	Seminar
Common Course to fulfill POs	Industrial Training
Common Course to fulfill POs	Industrial Practices
T49 Install and commissioning of precast structural elements.	Advanced Structural Analysis
T31 Perform test for foundation soil of construction project as per IS provisions.	Foundation Engineering
T40 Perform non destructive test for concrete	Advanced Concrete Technology
T39 Create awareness regarding using and operating Advanced plants and Equipments for mega structures T46 Use and Application of Machines/Equipments such as Mixer, Vibrator, Crain, Truck Mixer, Pumps, Batch Plant etc	Advanced Construction Equipments
T66 Choose appropriate method and techniques for repairs & maintenance. T67 Selection of different materials for repairs of defects T68 Supervise construction & maintenance of structures T69 Carry out inspection to identified failure of structure T70 Maintain civil Engineering structures	Maintenance of structures
T43 Apply Cost effective measures for Low Cost Housing.	Low Cost Housing
Common Course to fulfill PO7, PO9, PO10	Finishing School
Common Course to fulfill POs	Free Electives

8.12 Program Structure

The program structure of the Civil Engineering program is developed as described in chapter 6 previously and is given below.

8.12.1 Program Structure Level I: General Studies

Table 8.6. Program Structure Level I: General Studies

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	EN101E	English	Nil	03	00	02	04	70	30	50 [@]	25	175
2	EN102E	Communication Skills	Nil	03	00	02	04	70	30	50 [@]	25	175
3	CE101E	Construction Management	60 credits	04	00	00	04	70	30	Nil	Nil	100
4	EV101E	Environmental Science	Nil	01	01	00	02	70**	30	Nil	Nil	100
5	RD101E	Rural Development	Nil	00	00	02	01	Nil	Nil	50 [@]	25	75
Total				11	01	06	15	280	120	150	75	625

- Abbreviations:
TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA- Continuous Assessment
- Credit Formula 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit
- Symbolic Representation
** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course,

8.12.2 Program Structure Level II: Basic Science Courses

Table 8.7. Program Structure Level II: Basic Science Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	CA201E	Computer Application	Nil	00	00	04	02	Nil	Nil	50 [@]	25	075
2	PH201E	Engineering Physics	Nil	04	00	02	05	70	30	50 [@]	25	175
3	CH203E	Applied Chemistry	Nil	04	00	02	05	70	30	50 [@]	25	175
4	MH201E	Engineering Mathematics	Nil	04	01	00	05	70	30	Nil	Nil	100
5	MH202E	Applied Mathematics	MH201E	04	01	00	05	70	30	Nil	Nil	100
Total				16	02	08	22	280	120	150	75	625

8.12.3 Program Structure Level III: Engineering Sciences and Technical Arts Courses

Table 8.8. Program Structure Level III: Engineering Sciences and Technical Arts Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	ME301E	Engineering Graphics	Nil	02	00	04	04	70	30	Nil	25	125
2	WS301E	Workshop Practice	Nil	00	00	04	02	Nil	Nil	Nil	50	50
3	AM301E	Engineering Mechanics	Nil	03	01	02	05	70	30	50 [@]	25	175
4	CE301E	Basic Surveying	Nil	03	00	04	05	70	30	50 [@]	25	175
5	CE302 E	Building Drawing	ME301E	02	00	04	04	70	30	Nil	25	125
6	CE303E	Construction Materials	Nil	03	01	00	04	70 ^{**}	30	Nil	Nil	100
7	AM302E	Strength of Materials \$	AM301E	04	01	02	06	70	30	50 [#]	25	175
Total				17	3	20	30	420	180	150	175	925

8.12.4 Program Structure Level IV: Professional Courses

Table 8.9. Program Structure Level IV: Professional Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
a) Core Courses												
1	AM401E	Theory of Structures	AM302E	04	01	00	05	70	30	--	--	100
2	AM402E	Concrete Technology ^{\$}	Nil	02	00	02	03	70	30	50#	25	175
3	AM403E	Geotechnical Engineering	Nil	02	00	02	03	70	30	50@	25	175
4	AM404E	Design of RCC Structure ^{\$}	AM302E	03	01	04	06	70	30	50#	25	175
5	AM405E	Design of Steel Structure	AM302E	03	00	04	05	70	30	50@	25	175
6	CE401E	Advanced Surveying ^{\$}	CE301E	02	00	04	04	70	30	50#	25	175
7	CE402E	Building Construction ^{\$}	Nil	04	00	02	05	70	30	50#	25	175
8	CE403E	Hydraulics ^{\$}	Nil	04	00	02	05	70	30	50#	25	175
9	CE404E	Estimating & Costing ^{\$}	CE302E	03	00	04	05	70	30	50#	25	175
10	CE405E	Transportation Engineering ^{\$}	Nil	04	00	02	05	70	30	50#	25	175
11	CE406E	Water Resources Engineering ^{\$}	Nil	04	00	02	05	70	30	50#	25	175
12	CE407E	Environmental Engineering ^{\$}	Nil	04	00	02	05	70	30	50#	25	175
13	CE408E	Building Services	CE402E	00	00	04	02	Nil	Nil	50@	25	075
14	CE409E	Contracts , Accounts & Valuation	Nil	00	00	04	02	Nil	Nil	50@	25	075
Sub Total (a)				39	2	38	60	840	360	650	325	2175

8.12.5 Program Structure Level IV: Professional Courses (Project Courses)

Table 8.10. Program Structure Level IV: Professional Courses (Project Courses)

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
b) Project Courses												
15	CE410E	Road Project ^{\$}	CE405E	00	00	04	02	Nil	Nil	50 [#]	50	100
16	CE411E	Application Of CAD	CA201E	00	00	04	02	Nil	Nil	50 [@]	50	100
Any one from 17A & 17B												
17A	CE412E	Industrial Project (Civil) ^{\$}	100 credits	00	00	04	02	Nil	Nil	100 [#]	50	150
17B	AM406E	Industrial Project (Structure) ^{\$}	100 credits	00	00	04	02	Nil	Nil	100 [#]	50	150
Sub Total (b)				00	00	12	06	Nil	Nil	200	150	350
c) Seminar and Industrial Training												
18	SE401E	Seminar	60 credits	00	00	02	01	Nil	Nil	50 [@]	50	100
Any one from 19A & 19B												
19A	ID401E	Industrial Training	70 credits	00	00	02	01	Nil	Nil	50 [@]	50	100
19B	ID402E	Industrial Practices	70 credits	00	00	02	01	Nil	Nil	50 [@]	50	100
Sub Total (c)				00	00	04	02	Nil	Nil	100	100	200
Total (a) + (b) + (c)				39	2	54	68	840	360	950	575	2725

8.12.6 Program Structure LevelV: Elective Courses

Table 8.11. Program Structure Level V: Elective Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
a) Professional Electives (Any three)												
1	AM501E	Advanced Structural Analysis	AM401E	04	00	02	05	70	30	50@	25	175
2	AM502E	Foundation Engineering	AM403E	04	00	02	05	70	30	50@	25	175
3	AM503E	Advanced Concrete Technology	AM402E	04	00	02	05	70	30	50@	25	175
4	CE501E	Advanced Construction Equipments	CE402E	04	00	02	05	70	30	50@	25	175
5	CE502E	Maintenance of Structures	CE402E	04	00	02	05	70	30	50@	25	175
6	CE503E	Low Cost Housing	CE402E	04	00	02	05	70	30	50@	25	175
Sub Total (a)				12	00	06	15	210	90	150	75	525
b) Free Elective – Non-Technical												
1	FS501E	Finishing School	Nil	00	00	04	02	Nil	Nil	50@	25	75
Sub Total (b)				00	00	04	02	00	00	50	25	75

8.12.7 Program Structure Level V: Elective Courses

Table 8.12. Program Structure Level V: Elective Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
c) Free Electives Technical (Any one) % Not offered for Program CE												
	FE501E	Basic Building Drawings %	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
1	FE 502E	RAC Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
2	FE503E	Electrical Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
3	FE504E	Hobby Electronics	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
4	FE505E	Basic Packaging Technology	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
5	FE506E	Industrial Metallurgical Practices	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
6	FE507E	Computer Network	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
7	FE508E	PC Architecture & Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
8	FE509E	Fabric Selection and Care	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
9	FE510E	Two & Four Wheeler Technology	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
10	FE511E	Energy Conservation and Management	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
11	FE512E	Learning Ability Development	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
Sub Total				00	00	04	02	Nil	Nil	50	25	75
Total (a) + (b) + (c)				12	00	14	19	210	90	250	125	675

8.12.8 Program Structure Abstract

Table 8.13. Program Structure Abstract

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Level	Course Title Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Credit Percentage (Approx.)	Examination Scheme (Max. Marks)				
			TH	TU	PR			Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	I	General Studies	11	1	6	15	10	280	120	150	75	625
2	II	Basic Science Courses	16	2	8	22	14	280	120	150	75	625
3	III	Engineering Sciences and Technical Arts Courses	17	3	20	30	20	420	180	150	175	925
4	IV	Professional Courses	39	2	54	68	44	840	360	950	575	2725
5	V	Elective Courses	12	0	14	19	12	210	90	250	125	675
Total			95	8	102	154	100	2030	870	1650	1025	5575

Above programme structure approved in PBOS meeting held on 18th April, 2016 for implementation from Academic session 2016-17.

8.13 Award of Class Courses

Table 8.14. Award of Class Courses

DIPLOMA IN CIVIL ENGINEERING												
Sr. No	Course Code	Course Title	Prerequisite courses/credits	Teaching Scheme (TH,TU,PR Hrs./Week)*			Total Credits*	Examination Scheme (Max. Marks)				
				TH	TU	PR		Theory		Practical		Total Marks
								TEE	CA	TEE	CA	
1	AM302E	Strength of Materials \$	AM301E	04	01	02	06	70	30	50 [#]	25	175
2	AM402E	Concrete Technology \$	Nil	02	00	02	03	70	30	50 [#]	25	175
3	AM404E	Design of RCC Structure \$	AM302E	03	01	04	06	70	30	50 [#]	25	175
4	CE401E	Advanced Surveying \$	CE301E	02	00	04	04	70	30	50 [#]	25	175
5	CE402E	Building Construction \$	Nil	04	00	02	05	70	30	50 [#]	25	175
6	CE403E	Hydraulics \$	Nil	04	00	02	05	70	30	50 [#]	25	175
7	CE404E	Estimating & Costing \$	CE302E	03	00	04	05	70	30	50 [#]	25	175
8	CE405E	Transportation Engineering \$	Nil	04	00	02	05	70	30	50 [#]	25	175
9	CE406E	Water Resources Engineering \$	Nil	04	00	02	05	70	30	50 [#]	25	175
10	CE407E	Environmental Engineering \$	Nil	04	00	02	05	70	30	50 [#]	25	175
11	CE410E	Road Project \$	CE405E	00	00	04	02	NIL	NIL	50 [#]	50	100
12A	CE412E	Industrial Project (Civil) \$	100 credits	00	00	04	02	NIL	NIL	100 [#]	50	150
12B	AM406E	OR Industrial Project (Structure) \$	100 credits	00	00	04	02	NIL	NIL	100 [#]	50	150
TOTAL				34	2	34	53	700	300	650	350	2000

8.14 Curriculum at a Glance

Table 8.15. Curriculum at a Glance

SN	CRITERION	RESPONSE
1	Total No. of Courses in a Program	55
2	Total courses required	41
3	No. of courses having Theory papers	29
4	No. of courses having non Theory exam.	12
5	No. of General Studies Courses	5
6	No. of Basic Science Courses	5
7	No. of Engineering Science Courses	7
8	No. of Professional Core Courses	14
9	No. of Professional Elective Courses	3/6
10	No. of Professional Free Elective Courses	2/12
11	No. of Project Courses	3/4
12	No. of Seminar and Industrial Training courses	2/3
13	Total Credits (1 ThHr = 1Credit& 2PrHr = 1Credit)	154
14	Total Marks	5575
15	Proportion of Hours (Periods), Th : Pr	50:50 (approx.)
16	Proportion of Credits, Th : Pr	67:33 (approx.)
17	Proportion of Marks; Th : Pr	52:48 (approx.)
18	Total courses for Award of Class	12
19	Total theory paper courses for Award of Class	10
20	Total marks for Award of Class	2000

8.15 Courses Flow Diagram

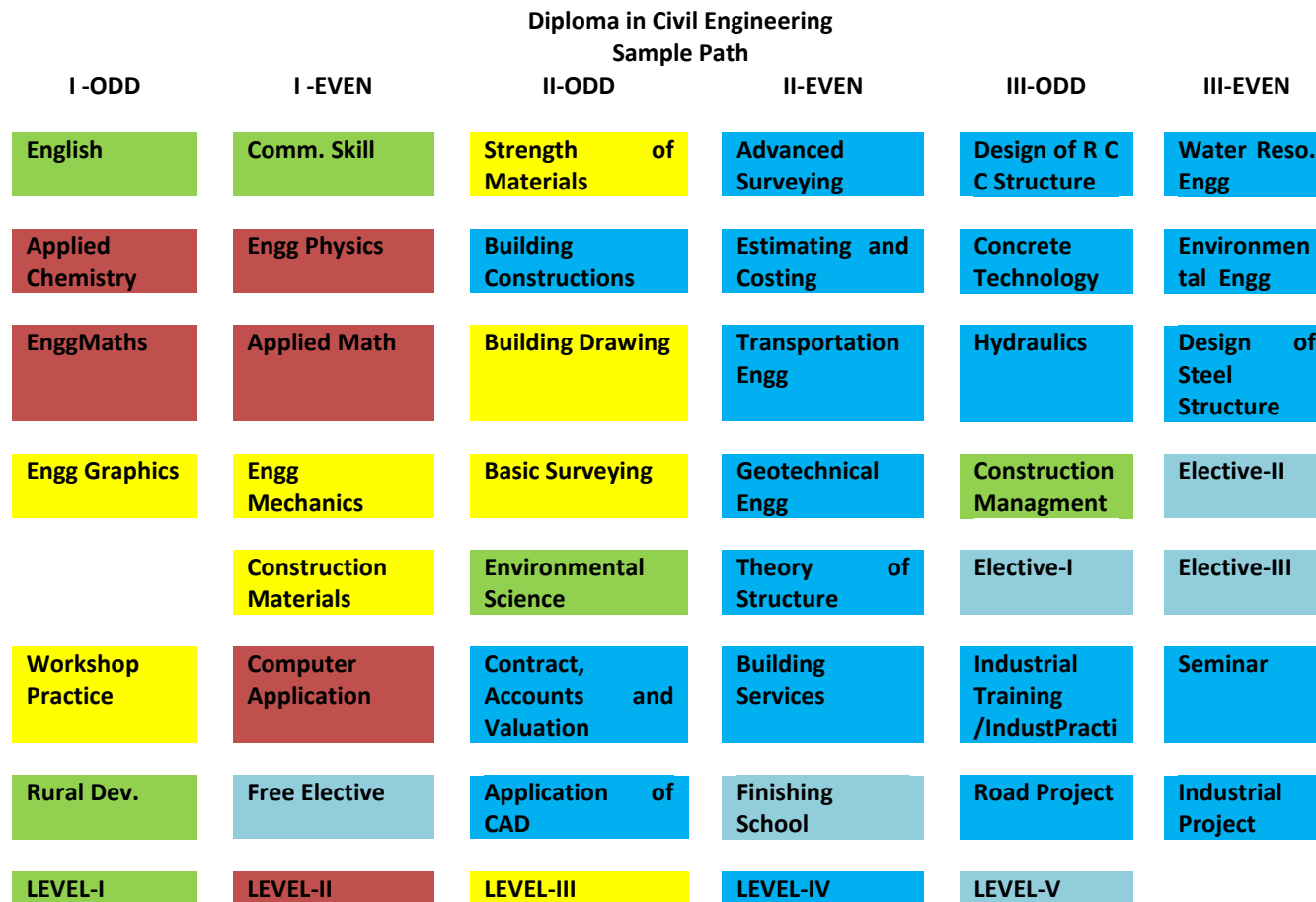


Figure 8.1. Courses Flow Diagram (Sample Path)

APPENDIX A

Curriculum

LEVEL - I

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE,ME,EE,EC,PK,MT,IT,AE,CM,TX,TR
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: EN101E
COURSE TITLE	: ENGLISH
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

The basic structure of English through Grammar enhances Holistic development as an individual as well as their role in the world. While teaching this course, complete emphasis will be laid on enhancing expression of ideas in English by the students. Excellence in this language enables a technician to develop his professional career as well as a strong standing in society.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Construct grammatically correct sentences.
2. Express ideas effectively in oral and written form.
3. Enhance comprehending abilities.
4. Develop interest in and appreciate literature.
5. Use social skills and be conversant.
6. Speak sentences with correct intonations.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Application of Grammar	1. Identify grammatical rules to form correct sentences. 2. Use correct sentence pattern in writing and speaking. 3. Enrich vocabulary. 4. State and identify various tenses to be used in a situation.	1.1 Articles :Appropriate use of definite and indefinite articles 1.2 Prepositions: To use correct prepositions as per context. 1.3 Phrases: Combining words to form various phrases. 1.4 Tenses: Appropriate uses of tenses in given situations. 1.5 Voice: use of active and passive voice. 1.6 Narration: Conversion of direct and indirect speech.	12
2. Text	1. Present oral summary of topics read or heard. 2. Adjust speed of reading. 3. Follow oral instructions and interpret them to others 4. Present summary of topics read and heard.	2.1 Text: Learning to read fluently and to develop insight through prose and poetry. Selected prose and poetry prescribed in the text. 2.2 Prose: 1. Positive Thinking- By Stephen 2. Vision 2020- Dr. A.P.J. Abdul Kalam. 3.What India Wants: A.Our muddled Generation- DineshKumar. B. Employers want Employees not Exam results –Manish Sabharwal. 4. The Last Cab Ride- Kent Newburn 2.3 Poem: 1.Kalahandi-Jaganath Prasad Das 2.Money Madness-D.H. Lawrence 3. Where the mind is without fear- Rabindranath Tagore. 4. Voice of the unwanted Girl-Sujata Bhatt.	16
3. Success stories And Seen passages for Comprehension.	1. Take down lecture notes while listening. 2. Write single or multiple sentences. 3. Comprehend main ideas and reproduce them. 4. Ask pertinent question as well as to answer them.	3.1 Success stories:(selected Two success stories from text) 1."It happed in India" Kishor Biyani 2. Aditya Kumar Birla. 3.2 Comprehension: (Selected two passages from the text)	06

4. Vocabulary Building	1. Use word formation devices. 2. Use new words in sentences. 3. Read/write new words from various media. 4. Enrich vocabulary through reading.	4.1 Synonyms and Antonyms 4.2 One word substitution. 4.3 Using words and expressions appropriate to audience.(peers, superiors, subordinates and others)	04
5. Conversational Practice.	1. Use correct pronunciations 2. Pronounce the words correctly. 3. Speak sentences with correct intentions. 4. Use correct accent/stress for the words.	Sample situations for conversational practice. 5.1 Introducing yourself and others. 5.2 Meeting and parting. 5.3 Requests 5.4 Inquiries and information. 5.5 Asking, Giving and Refusing Permission. 5.6 Apologizing.	04
6 Writing Techniques.	1. Expand ideas into paragraphs 2. Prepare speeches as per situations 3. Connect multiple sentences.	6.1 Paragraph writing: Elaborate and expand ideas. 6.2 Speech writing: Welcome speech, Farewell speech, Introducing the guests and vote of thanks.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Tense Busters -All levels(To be performed in language lab)	Application of Grammar)	04
2.	Reading and making notes	Prose	02
3.	Summarizing poems	Poetry	02
4.	Reading and making notes	Short stories	02
5	Reading and making notes	Prose	02
6	Comprehending passage	Comprehension passage	02
7	Issues in English(to be performed in language lab)	Vocabulary building	06
8	Formal conversations-Telephonic ,Video conferencing	Conversation practice	02
9	Introducing –self and others	Conversation practice	02
10	Observation of oratory speeches of renowned speakers	Conversation practice	02
11	Preparing speech and presenting	Writing techniques	02
12	Writing a paragraph on given topic	Writing techniques	02
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Application of Grammar	06(04)	06(04)	00(00)	16(12)
02	Text	04(04)	16(04)	06(00)	26(08)
03	Short stories	04(04)	08(04)	00(00)	08(04)
04	Vocabulary Building	04(00)	04(04)	00(00)	08(04)
05	Conversational Practice	00(00)	00(00)	06(06)	06(06)
06	Writing Techniques	00(00)	00(00)	06(06)	06(06)
	Total	18(12)	34(16)	18 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Application

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	U	2	1	U	2	1	U	2	1	U	2	1	U	2	1	U	2	5/7
	1	R	2																
02	2	U	4	2	R	4	2	R	4	2	U	4	2	U	4				3/5
03	3	U	4	3	U	4	2	R	4	2	R	4	3	U	4				3/5
04	4	R	4	4	A	4	1	R	4	1	R	4	1	U	4				3/5
05	5	A	6	5	A	6	5	U	6										2/3
06	6	A	6	6	A	6	6	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
End Of Course		End Of The Course		Questionnaires				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	05
2	Overall presentation of given assignment	05
3	Viva voce	10
4	Activity	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	3	-	-	-	-	-	3	3	-	-
2	3	-	3	-	-	-	-	-	3	-	-	-
3	-	-	3	-	-	-	-	-	3	3	-	-
4	-	-	3	-	-	-	-	-	-	-	-	-
5	-	-	3	-	-	-	1	1	3	3	-	-
6	3	-	3	-	-	-	-	1	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Positive Thinking	Stephen, Inspirational Stories ,June 2011	-
2	Vision 2020	Dr.A.P.J. Abdul Kalam 'Prism', Macmillan Publication.	1403928282
3	What India Inc-	Dinesh Kumar, Manish Sabharwal, Golden Harvest,	9788125059523
4	The Last Cab Ride	'Life', by Stephen	-
5	Kalahandi	Jaganath Prasad Das, Reflection on vital issues', by P.J.George	9788125041764
6	Money Madness	D.H.Lawrence by P.J.George Orient Blackswan 2010	9788125041764
7	Where the mind is without fear	Rabindranath Tagore Prism, Macmillan Publication	1403928282

8	Voice of the unwanted girl	Sujata Bhatt Prism, Macmillan Publication	1403928282
9	High School English Grammar and Composition	Wren and Martin Revised by Dr.N.D.V. Prasada Rao, S.Chand Publication.	81-219-0009-3
10	Business communication	Urmila Rao Himalaya Publication, 2011	81-8318-438-3
11	Contemporary English Grammar-structure and composition	David Green Revised Edition,2004 Himalaya Publication	033392183-6
12	Interactive English	S.K.Gangal, Revised Edition 1997 Allied Publishers	81-7023-678-9
13	Applied English Grammar and composition.	Dr. P.C. Das, 2013, New Central Book Agency.	978-81-7381-542-3
14	English for Practical Purposes	Z. N. Patil, B.S. Valke	033935098

❖ **E-REFERENCES:**

www.talkenglish.com-grammar , assessed on 12th March, 2016

www.edufind.com-englishgrammar ,assessed on 12th March, 2016

www.perfect-english-grammar.com, assessed on 12th March, 2016

www.yosuccess.com, assessed on 13th March, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. Sadiya Raza	Lecturer in English & Coordinator	Government Polytechnic, Nagpur.
2.	Dr. Nutan Chotai	Expert, Head of Dept.	LAD College, Nagpur.
3.	Mrs. K.N. Deshmukh	Expert, Head of Humanities	SDMP, Nagpur.
4.	Dr. Shilpa Sarode	Expert, Asst. Professor	LAD, Nagpur
5.	Mrs. M.M. Machale	Lecturer in English	Government Polytechnic, Nagpur.
6.	Ms. Humeera Quraishi	Visiting Lecturer in English	Government Polytechnic, Nagpur.
7.	Ms. Marlyn Fernandes	Visiting Lecturer in English	Government Polytechnic, Nagpur.
8.	Ms. Nazish Ahmed	Visiting Lecturer in English	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA INCE,ME,EE,EC,PK,MT,IT,AE,CM,TX,TR
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: EN102E
COURSE TITLE	: COMMUNICATION SKILLS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03 TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM.	: 03 HRs
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

In this present competitive scenario, proficiency in communication skills is one of the basic needs of technical students. A diploma holder is therefore expected to meet the challenges of communicating with his peers, superiors, subordinates and clients. Communication skills will help him towards achievement of perfection.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply concepts of communication in the given situation.
2. Modify language skills.
3. Execute requisite qualities as per industry requirements.
4. Compose official documentation.
5. Participate in and conduct group discussions and meetings effectively
6. Use correct pronunciations and intonations.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Communication	1. Identify modern concept of communication. 2. Breaks down barriers to communicate effectively. 3. Modify appropriate body language. 4. Derive confidence while conversing.	1.1 Definition, Process, Types: Verbal-Non Verbal, Formal-Informal, Upward-Downward, Horizontal. 1.2 Barriers of communication: Physical, Mechanical, Psychological, Language, Status . Ways to overcome barriers. 1.3 Selection of proper channels of communication. 1.4 Non-verbal communication in detail: Body language, Eye contact, Dress and appearance, color, sound, Gestures, Postures, Pictorial representations.(Maps, Charts ,Graphs)	14
2. Inculcation of various generic skills.	1. Identify their receptive skills to strengthen their productive skills. 2. Derive listening abilities. 3. Use detailed write-ups 4. Participate in conversations.	2.1 Listening and reading skills- Importance of listening skills, levels of listening, Types of reading, Phonetics, IPA 2.2 Speaking and writing – Importance of Pronunciation, Importance of Debate.	08
3. Areas of self-Development.	1. Identify strengths and weakness. 2. Classify different types of motivation in one's life. 3. Plan presentations properly. 4. Modify leadership qualities.	3.1 Aims of self-development, self-awareness with respect to strength and weakness, How to overcome weakness for acquiring self-confidence. 3.2 Motivation –Introduction, Definition, Types with example. 3.3 Presentation skills – Parameters, Appearance, use of body language, Eye contact, content preparation, Depiction of interest of audience. 3.4 Time management- Importance, Process of time planning. 3.5 Team Building and Leadership qualities.	10
4. Development of	1. Plan group discussion. 2. Relate behavior during and post	4.1 Interview Techniques: Preparation, Behavior during interview, post interview. 4.2 Group discussion: Being the first	06

soft skills.	interview. 3. State and justify one's abilities.	member, how to make a general discussion, to give a concrete shape to discussion, purpose.	
5. Business correspondence	1. Identify various types of letters. 2. List down one's qualities by writing resume. 3. Use various reports to express ideas effectively in English	5.1 Letters: Job application and Resume writing Leave letter, Sales letter, Enquiry letter, order letter, complaint letter. 5.2 Report writing: Progress, Accident, Trouble, Feasibility. 5.3 Notices, circular, Memorandum-mail messages.	10
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practic al's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Master the skill of face -to -face communication	Communication	02
2.	Sharpen one's body language while communicating with the help of Extempore/Impromptu.		02
3.	Demonstrate through role-play skills of a good communicator like RJ, News reader, commentator.		04
4.	Master the art of reading, writing, listening skill(to be performed in Language lab using software)	Inculcation of various Generic skills	06
5	Execute the art of Debate		02
6	Transcribe the given words phonetically		02
7	Master the skill of oral presentation by presenting a topic through PowerPoint presentation.	Areas of self-development.	02
8	Demonstrate leadership qualities		02
9	Manipulate Group Discussion by active participation	Development of soft skills	02
10	Build interview techniques through Mock Interview		02
11	Implement the art of writing E-mails and reports	Business correspondence	02
12.	Implement the art of writing Formal drafting's by preparing resume, letters.		02
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Communication	06(06)	04(04)	06(04)	16(14)
02	Inculcation of various Generic skills among future engineers	02(00)	08(10)	00(06)	10(16)
03	Areas of self Development	06(00)	06(06)	06(00)	18(06)
04	Development of soft skills	02(04)	08(00)	00(00)	10(04)
05	Business Correspondence	00(00)	08(04)	08(00)	16(00)
	Total	20(08)	30(20)	20 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	A	2	3	U	2	5/7
	1	R	2																
02	1	R	4	1	R	4	2	U	4	2	U	4	5	U	4				3/5
03	3	R	4	4	R	4	2	U	4	3	U	4	5	U	4				3/5
04	1	U	4	5	U	4	4	U	4	1	A	4	4	U	4				3/5
05	2	A	6	3	A	6	3	U	6										2/3
06	1	A	6	5	A	6	2	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	05
2	Overall presentation of given assignment	05
3	Viva voce	10
4	Activity	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	2	-	3	-	-	-	-	3	3	3	-	-
2	-	-	3	-	-	-	-	-	3	-	-	-
3	-	-	3	-	-	-	-	3	3	3	-	-
4	2	-	3	-	-	-	-	-	3	3	-	-
5	-	-	3	-	-	-	-	3	3	3	-	-
6	-	-	-	-	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Professional Communication skills	S.R.Pravin, S.Chand Publications	81-219-2092-02
2.	Developing Communication skills	Macmillan Publications, Revised Edition, 2011	0333929195
3.	Business communication and Soft skills.	G.S.R.K , Himalaya Publication, First Edition, 2009	978-81-8488-596-5
4.	Secret of face to face communication.	Peter Urs, Bendar, Macmillan Publication	0333937139
5.	Technical communication principles and practices	Meenakshi Raman, Prakash Singh, Oxford University Press,	0-19-567695-5
6	Effective English Communication	Krishna Mohan, Raman Tata McGraw Hills,	13978-0-19-566804-9
7	Modern Commercial Correspondence	R.S.Pillai, Bhagwati, S.Chand & Co.	812190519-2

❖ **E-REFERENCES:**

www.mindtools.com.au, assessed on 12th March, 2016

www.interviewbest.com, assessed on 12th March, 2016

www.skillsyouneed.com-presentationskills, assessed on 12th March, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. Sadiya Raza	Lecturer in English&Coordinator	Government Polytechnic, Nagpur.
2.	Dr. Nutan Chotai	Expert, Head of Dept.	LAD College, Nagpur.
3.	Mrs. K.N. Deshmukh	Expert, Head of Humanities	SDMP, Nagpur.
4.	Dr. Shilpa Sarode	Expert, Asst.Professor	LAD, Nagpur
5.	Mrs. M.M. Machale	Lecturer in English	Government Polytechnic, Nagpur.
6	Ms. Humeera Quraishi	Visiting Lecturer in English	Government Polytechnic, Nagpur.
7.	Ms. Marlyn Fernandes	Visiting Lecturer in English	. Government Polytechnic, Nagpur.
8.	Ms. Nazish Ahmed	Visiting Lecturer in English	Government Polytechnic, Nagpur.

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GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: CE101E
COURSE TITLE	: CONSTRUCTION MANAGEMENT
PREREQUISITE	: 60 credits
TEACHING SCHEME	: TH: 04; TU: 00; PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: Nil
PT. EXAM	: 01 HRs

❖ RATIONALE:

Management of human and material resources in any organization is of primary importance to economize and optimize the cost factor. It is necessary for the students of civil engineering to use advanced scientific techniques of management. Civil engineering students need to understand the importance of Human Resource along with the scarce material resources.

❖ COURSE OUTCOMES:

After completing the course students will be able to-

- 1 Identify the roles of individuals, companies, and agencies involved in the construction process and communicate effectively.
- 2 Describe various types of organizational structures, principles of organization and role of Entrepreneurs in National development.
- 3 Apply various techniques and methods to plan, schedule and control construction projects.
- 4 Describe functions of Personnel Management.
- 5 Identify various techniques of material management and quality control.
- 6 State and describe various Labour laws.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1.Introduction to Management	1 Define Management, Administration. 2 Compare Management and Administration. 3 Define Function of Management. 4 Apply the principles of management. 5 State the social responsibility of civil engineer	1.1 Definition of Management 1.2 Necessity of Management in construction industry 1.3 Evolution of management – Role of F.W. Taylor, Henry Fayol and Gilberth 1.4 Henry Fayol's Principles of Management 1.5 Function of management - Planning, Organizing, Directing, Controlling, Coordinating and Supervising 1.6 Application of Principles of management to Civil Engineering Construction projects. 1.7 Social and Public responsibility of Management 1.8 Levels of management and Management structure 1.9 Administration and Management	6
2.Orgnization and Entrepreneurship Development	1 Define the organization. 2 Compare various types of organizations. 3 Prepare typical organizational charts. 4 Interpret appropriate type of ownership. 5 Apply the principles of organization. 6 Define entrepreneurship. 7 State characteristics of entrepreneur. 8 Analyze Problems faced by women entrepreneurs 9 Understand need of rural entrepreneurship. 10 Interpret factors affecting entrepreneurial growth.	2.1 Definition of Organization 2.2 Need of organization 2.3 Principles of organization 2.4 Types of organization - Line, Line and staff and Functional organizations their merits and demerits. 2.5 Typical organizational charts for small, Medium and Large Construction Firms. 2.6 Organizational chart of Public Works Department and Irrigation department 2.7 Forms of Ownership- Proprietorship, Private Ltd. Company Joint Stock Company, Cooperative Societies with their definitions, scope, Merits and demerits of these forms of Ownership.. 2.8 Government, Semi Government and public undertaking, Organization working in construction and Power sector	14

		2.9 Definition of entrepreneurship, Characteristics of an entrepreneur, Functions of entrepreneur. 2.10 Role of entrepreneurship in national development. 2.11 Problems faced by women entrepreneurs. 2.12 Need for rural entrepreneurship. 2.13 Factors affecting entrepreneurial growth-economic factors, government actions	
3. Project Management	1. State the necessity of planning and scheduling. 2. Compare PERT (Project/ Programme Evaluation and Review technique) and CPM (Critical Path Method) methods of network analysis. 3. Prepare schedule for construction activities. 4. Calculate the project duration.	3.1 Necessity and importance of planning and scheduling 3.2 Pretender and Post tender planning of owner and contractor 3.3 Preparation of schedule- work break down structure, 3.4 Types of schedules - Construction schedule, material schedule, manpower schedule, financial schedule. 3.5 Bar chart method- procedure, merits and limitations of bar chart. Preparation of bar chart for construction work of septic tank, open well, isolated column footing. 3.6 Network methods of planning and scheduling - Terms associated, Precautions to be taken, Numbering the events by Fulkerson's Rule and Development of network. C.P.M - Concept of C.P.M, terminology used , Types of time estimate - EST, EFT, LST, LFT. Critical path - forward pass, backward pass, critical activities, and various floats- total, free and independent, Calculation of project duration 3.7 P.E.R.T- Beta distribution curve, Various time estimates - Optimistic, Pessimistic, Most likely and Expected duration. Simple Problems on CPM and P.E.R.T. 3.8 Advantages and limitations of network method, Comparison between C.P.M and P.E.R.T	14
4. Human Resource	1 Define Personnel Management.	4.1 Personnel management - Definition ,and Functions. Types of labour	10

Management	2 Describe the functions of Personnel Management. 3 Identify appropriate style of leadership. 5. Interpret the human needs. 4 Apply the motivational techniques.	4.2 Staffing - Introduction to Human Resources planning, Recruitment Procedure. 4.3 Leadership –Types of leadership its suitability, advantages and disadvantages, Qualities of good leader. 4.4 Human relations and its effects on efficiency. 4.5 Human needs – varieties and its hierarchy 4.6 Douglas Mc Gregor's Theory X and Theory Y 4.7 Kinds of Motivation, Hygiene and Motivational Factors, Herzberg model.	
5. Material Management and Quality Control	1. State inventory management techniques. 2. Identify and choose appropriate method for inventory management. 3. Employ appropriate method for inventory procurement. 4. Define terms Quality, TQM and ISO. 5. Describe various quality control techniques. 6. Compare various techniques of quality control. 7. Interpret importance of ISO, Quality Circle.	5.1 Inventory management - meaning and objectives of Inventory and Inventory control. (No numerical problems) 5.2 Techniques of inventory control, ABC analysis 5.3 Economic order quantity (EOQ) Ideal inventory model (reorder point), Graphical representation 5.4 Modern Techniques of Material management 5.5 Introduction to JIT/SAP/ERP techniques of Inventory management. 5.6 Concept of Quality ,Definition of Quality and Quality Assurance, Introduction to International Organization for Standardization (I.S.O.), Quality circle. 5.7 Brief Introduction to Total Quality Management (TQM), KAIZEN	14
6. Labour Laws	1. Identify the necessity of labour laws. 2. Describe the methods of payment to worker. 3. Interpret provisions of various acts.	6.1 Introduction about Labour law, Necessity of Laws. 6.2 Method of wage payment- Time rate system, Piece rate system, 6.3 Meaning and important Provision of- Minimum wage Act, Workmen compensation act -Definitions of Dependent, Partial and Total Disablement, Contract Labour Act, ESI Act, Industrial Dispute Act, Factory Act.	6
Total Hrs			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Nil			

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Management	02(02)	04(04)	00(00)	06(06)
02	Organization and Entrepreneurship Development	00(02)	08(00)	06(06)	14(08)
03	Project Management	02(00)	04(04)	12(06)	18(10)
04	Human Resource Management	02(04)	08(04)	00(00)	10(08)
05	Materials Management and Quality Control	06(00)	06(00)	04(00)	16(04)
06	Labour Laws	02(00)	04(00)	00(00)	06(04)
		14(08)	34(20)	22(12)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	2	R	2																
02	1	U	4	2	U	4	3	U	4	4	R	4	4	U	4				3/5
03	2	U	4	4	U	4	4	U	4	6	U	4	3	U	4				3/5
04	5	R	4	6	U	4	5	A	4	1	U	4	5	U	4				3/5
05	2	A	6	3	A	6	3	A	6										2/3
06	5	U	6	3	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
NIL		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	3	-	-	3	-	-	-	-
2	-	3	-	-	3	-	-	3	-	3	3	-
3	1	3	3	3	-	-	3	3	-	3	3	-
4	-	-	-	-	3	-	3	-	2	-	-	-
5	-	3	-	3	-	-	3	-	-	3	3	-
6	-	3	-	-	-	-	3	-	-	-	3	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Industrial Engineering & Management	T.R.Banga & S.C.Sharma, Khanna Publishers, Edition-25, 2014	10: 81-7409-078-9 13:978-81-7409-078-9
2.	Industrial Engineering And Management	O.P. Khanna, Dhanpat Rai, New Delhi, 1999	978-81-89928-35-3
3.	Construction Planning and Management	P.S.Gahlot and B.M.Dhir, New Age International, Pvt. Ltd. New Delhi	81-224-0411-1
4.	Construction Planning and Management	Dr.U.K.Shrivastava, Galgotia Publication , Pvt. Ltd. New Delhi	81-7515-246-X
5.	Construction Management And Accounts	V.N.Vazirani and S.P.Chandola, Khanna publishers ,Delhi	978-81-7409-303-5
6.	Entrepreneurial Development	S.S.Khanka, S.Chand & Co. Ltd, Delhi, 1 st , 1999, reprint 2006	81-219-1801-4

❖ **E-REFERENCES:**

- www.isixsigma.com › Methodology › Project Management assessed on 16April 2016
- www.iso.org/ assessed on 16April 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr.T. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. R. N. Giradkar	Head of Department Civil Engineering (Second Shift)	Government Polytechnic, Nagpur.
3.	Ms. D.A.Khandare	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. M. R. Shelote	Consultant Engineer	M R Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
6.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/TR
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: EV101E
COURSE TITLE	: ENVIRONMENTAL SCIENCE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 01; TU: 01; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 01 Hr. (Objective Type Online Examination)
PR. TEE	: NIL
PT.	: 15 MINUTES (Objective Type offline Examination)

❖ RATIONALE:

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution, poses major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental science, which shall provide an insight into various environment related issues.

Environmental science is an interdisciplinary academic field that integrates physical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems & gives an insight into solutions of Environmental problems

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Define the terms related to Environmental Studies.
2. Identify natural resources and resolve problems associated with them.
3. Identify alternate energy resources and use them efficiently during their engineering practices.
4. Develop habits which will cause less harm to environment
5. Analyze key issues about environment and create public awareness about those environmental issues.
6. Follow environmental ethics as lifelong learning.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1. Earth Systems and Resources	1. Name the historical events of earthquakes, volcanoes, Tsunami, cyclone & landslides in the world. 2. Identify problems associated with soil, water 3. Define weather and climate. 4. Analyze the global water problems.	1.1 Earth Science: Concepts of Geologic time scale; earthquakes, volcanoes , Tsunami , cyclone & landslides 1.2 The Atmosphere: Weather and climate; the Coriolis Effect 1.3 Global Water Resources and Use: Present scenario, surface and groundwater issues; global problems; and its conservation. 1.4 Soil : soil erosion and other soil problems; methods of soil conservation	02
2. Concept of Biodiversity	1. Define Biodiversity 2. List Levels of biodiversity 3. Define and list the biodiversity hotspots 4. List the endangered species 5. Prepare a report on value of Biodiversity 6. Suggest methods /steps for Biodiversity conservation	2.1 Definition of Biodiversity 2.2 Levels of biodiversity 2.3 Value of biodiversity 2.4 Threats to biodiversity, loss of biodiversity (biodiversity hotspots) 2.5 Conservation of biodiversity (modern methods of biodiversity conservation)	02
3. Energy Resources and Consumption	1. Match the energy forms projects 2. List various forms of energy 3. State advantages and disadvantages of forms of energy 4. Select appropriate solutions of Efficient Use energy 5. Utilize techniques for energy consumption to reduce impact on environment.	3.1 Energy Consumption history 3.2 Present global energy use, Future energy needs 3.3 Energy forms:(conventional and non conventional) 3.4 Energy Conservation 3.5 Renewable Energy: Solar energy; solar electricity; biomass; wind energy; ocean waves and tidal energy; geothermal	03
4. Pollution	1. Define pollution and pollutants 2. List the types of pollutants. 3. Identify the Pollutants and their sources 4. Develop habits to reduce pollution 5. State the standard / limiting/ controlling values	4.1 Definition of pollution. 4.2 Air pollution: Definition, Classification, sources, effects, Prevention and ambient air quality standards. 4.3 Water Pollution: Definition, Classification, sources effects, Prevention And WHO and BIS water quality standards.	04

	of various types of pollution.	4.4 Soil Pollution/land pollution: Definition, sources, effects, prevention 4.5 Noise Pollution: Definition, sources, effects, prevention. 4.6 Biomedical Waste and E-Waste -- Origin, Effects and control Measures. 4.7 CPCB and MPCB norms and roles and responsibilities.	
5 Social Issues and Environment	1. Define sustainable development 2. Evaluate sources of Green house effect, acid rains, Global warming 3. List the incidences of Nuclear Accidents,	5.1 Concept of development, sustainable development 5.2 Watershed management , rain water harvesting 5.3 Global Warming, greenhouse effect; ozone depletion, relevant laws and treaties 5.4 Nuclear Accidents and Holocaust: Basic concepts and their effect on climate, , relevant laws and treaties	03
6. Environmental Education	1. Differentiate between formal and non formal education 2. List the various acts and their provisions 3. Develop awareness about environment.	6.1 Formal and non-formal education 6.2 Role of Govt. and Non-Govt. Organization 6.3 Indian constitutional provisions regarding the environment. Brief description of the following acts and their provisions: Environmental Protection Act and Prevention of Water, air and noise Pollution Act. 6.4. Concept EIA and environmental Ethics	03
Total Hrs.			16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare report on Loss of biodiversity, its conservation and also describe biodiversity hotspots.	Concept Of Biodiversity	4
2	Prepare report on use of various renewable energy sources.	Energy Resources And Consumption	4
3	Group discussion and Assignment on article collection from news papers, magazines and internet on local environmental pollution.	Pollution	4
4	Prepare report on case study of Industrial/Nuclear/any other Disaster in India.	Social Issues And Environment	4

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Earth Systems And Resources	02(00)	04(00)	02(00)	08(00)
02	Concept Of Biodiversity	04(00)	08(00)	02(00)	14(00)
03	Energy Resources And Consumption	04(00)	08(00)	04(06)	16(00)
04	Pollution	04(00)	10(04)	06(00)	20(04)
05	Social Issues And Environment	02(00)	04(00)	00(00)	16(12)
06	Environmental Education	02(00)	02(00)	02(00)	06(00)
	Total	18(00)	36(00)	16 (00)	70 (00)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Bit 7		
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M
01 To 35	1	R	2	2	R	2	3	R	2	4	R	2	1	U	2	2	R	2	1	U	2
	3	U	2	2	A	2	1	A	2	2	U	2	3	R	2	4	U	2	2	U	2
	4	A	2	4	U	2	4	U	2	5	R	2	2	U	2	3	U	2	4	R	2
	2	U	2	3	U	2	5	R	2	4	U	2	3	U	2	5	U	2	3	A	2
	4	U	2	3	A	2	4	A	2	6	R	2	6	U	2	6	U	2	4	A	2

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Online Examination Report	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	--	--	--	3	3	3	3	--	3	-	-
2	3	--	--	--	--	3	--	--	--	3	-	-
3	3	--	--	--	3	3	--	--	--	3	-	-
4	3	--	--	--	3	3	3	3	--	3	-	-
5	--	--	--	--	3	3	3	3	2	3	-	-
6	--	--	--	--	3	--	3	3	2	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Environmental studies	Oxford University Press, New Delhi. 2011	0-19-807228-2
2.	Environmental Science	Y.K. Singh, New Age International, New Delhi	8122418481, 9788122418484
3.	A Text Book Of Environmental Science	Arvind Kumar, APH Publishing, New Delhi	817648590X, 9788176485906
4.	Environmental Engg	A Kamla & D.L.Kanth Rao, Tata Mc Graw-Hill, New Delhi	0-07-451708-2
5.	A Textbook of Environmental Studies	Shashi Chawla, Tata Mc Graw-Hill, New Delhi	9781259006388

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Lists_of_nuclear_disasters_and_radioactive_incident_s, accessed on 20 January 2016
2. www.legalserviceindia.com/articles/noip.htm accessed on 18 March 2016
3. <https://prezi.com/8mnz--ldkybc/apes-unit-1-earth-systems-resources/> accessed on 23 March 2016
4. <http://www.conserve-energy-future.com/AlternativeEnergySources.php>, 18 March 2016

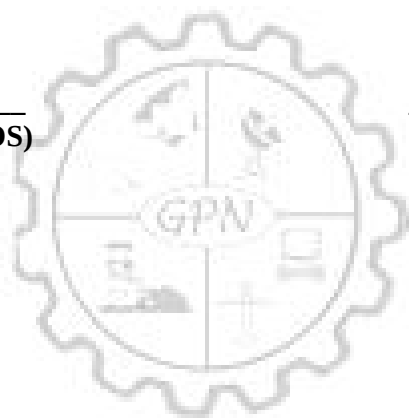
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. S J Patil	Head of Civil Engineering, (I Shift)	Government Polytechnic, Nagpur.
2	R N Giradkar	Head of Civil Engineering, (II Shift)	Government Polytechnic, Nagpur.
3	N. U Sulbhewar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	D. A. Khandare	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
6	Mr. M. R. Shelote	Consultant Engineer	M R Associates, Nagpur
7	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
8	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/TR
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: RD101E
COURSE TITLE	: RURAL DEVELOPMENT
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 01(1TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

India is a rural developing country. About 70 percent of the total inhabitants are living in rural area. The development of India as a whole cannot be possible without development of the rural areas. The Central and state Governments tried to develop rural area through various welfare, health, economic, and social schemes. But it is the moral duty of each urban person to think about the development of rural area.

Young students are said to be new Nation. Therefore, this subject has been introduced so that the students should aware about the rural scenario in India. They should think and work for the overall rural development as per the development indicators prescribed at International level. They should write, and work for the Rural – Urban Linkage to upgrade the rural level.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret Indian development indicators with International level.
2. Use and record questionnaire for rural survey.
3. Apply engineering knowledge for rural economy.
4. Suggest suitable scheme for rural development.
5. Prepare sustainable development plan for rural development.
6. Create suitable environment in rural area for development of every individual.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Write report of Development, Indicators of development, Rank of India in various development indexes (Individual task). Report includes: • Development, Modern Concepts, Indicators of development, • Importance, Scope and Objectives of RD. • Agriculture development, Agricultural allied development, Social and Human Development. • Rank of India in Human development index, Water and Sanitation Index, Shelter index, Education to all indexes, Health and wellness index.	Overview of Rural Development	04
2	Write report related to particular village (Group of 10 students). Survey, observe and evaluate Educational issues, Occupational issues, Agricultural issues, irrigation issues, migration issues, landless issues, Water supply and sanitation issues, Health issues, Poverty issues, Nutrition issues, Unemployment issues, Economy issues, Market for agriculture products issues, in Rural Development. Report includes: • Social structure of Rural India, Educational issues, Occupational issues, Agricultural issues, irrigation issues, migration issues, landless issues, Water supply and sanitation issues, Health issues, Poverty issues, Nutrition issues, Unemployment issues, Economy issues, Market for agriculture products issues, etc	Issues of Rural Development	06
3	Write report related to particular village (Group of 10 students). Survey, observe, evaluate and propagate Rural Development programmes (Sarva Shiksha Mission, Jal Swarajya Scheme, Water shed Management, Gobar Gas Scheme, Water Harvesting, MNREGA etc.) Run by Central and State Govt, according to directive principles in Indian Constitution. Report includes: • Constitutional provisions for Rural Development, Directive Principles. • Schemes of Central and State Govt. for Rural Development. • Role of GOs and NGOs. • Empowerment –Social, Educational, Economic, Women and Human. • Private Public Partnership (PPP), its advantages and disadvantages.	Constitutional Provisions and Programs for Rural Development	06

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
4	Write report related to particular village (Group of 10 students). Survey, observe and propagate Modern Technology (Rural Housing, Non Conventional Energy, Rural Water Supply and Sanitation, Agricultural allied industries etc.) in Rural Development. Report includes: • Low cost housing. • Rural water supply and sanitation, • Water conservation and Water shed management, • Non-conventional energy. • Computer application and Management Information system, Info – literacy, Global village • Solid waste management.	Technology for Rural Development	06
5	Write report related to particular village (Group of 10 students). Survey issues and challenges in Rural Development programs and suggest Rural – Urban link for social change in rural development and Nation Building. Report includes: • Basic micro-economic theories and concepts, Growth, Income, Employment, Finance. • Rural resources – Land, Forest, Water, Human, Capital and Market. • Rural Economy - Agriculture Reforms, Rural Finance, Rural Urban linkage. • Understanding BUDGET of Central and State Govt. • Corporate Social Responsibilities. • SEZ, Advantages and disadvantages on rural development.	Economical Developments	06
6	Present a report on Rural Development experiences of the same village, challenges, opportunities, suggestions. Presentation includes: • Success stories of rural development in India, Asia and other countries.	Rural Development Success Stories	04
Total			32

Note – The students shall select any one village and perform all practical based on experiences in that village.

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	25	10	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing skills, Data collection from internet, Writing references, etc.	05
2	Survey skills, Preparation of questionnaire, Gathering information through interviews, etc.	10
3	Knowledge of rural development schemes, its salient features, its role in rural development, etc.	10
4	Knowledge of modern technology, Tech terms, its need in rural area, rural development through technology, etc.	10
5	Rural urban linkage, sustainable human development, global village, etc.	05
6	Presentation and viva-voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	-	-	-	-	-	1	-	3	-	-
2	3	3	-	3	-	-	-	3	3	3	-	-
3	3	3	-	3	-	-	2	3	3	3	-	-
4	3	3	2	3	3	-	3	3	3	3	-	-
5	3	3	2	3	3	2	1	3	3	3	-	-
6	3	3	2	3	1	-	1	-	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Micro Enterprise & Rural Development In India,	Subrata Kumar Ray, Neha Publishers & Distributors.	9788183875752
2.	Rural Development Indian Context,	Expert Panel Of GPH, Publisher: GPH.	9789382688976
3.	Rural Development Planning And Management,	Expert Panel Of GPH, Publisher: GPH	9789382688990
4.	RURAL DEVELOPMENT, Concept and Recent Approaches, ,	A. Thomas William and A.J. Christopher, Edition – 2011.	9788131602652,
5.	Rural Development & Policies	Dr. B.D. Sharma,	9789381385418

6	Empowering Rural Development Through Panchayats.	Dr. H.K. Lal, Publisher: Neha Publishers & Distributors	9788174456250
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❖ **E-REFERENCES:**

- www.un.org/esa/agenda21/natlinfo/countr/israel/ruraldevelopment.pdf , assessed on 5th March 2016
- rural.nic.in/sites/downloads/NewReleases/Greening_RD_Report.pdf , assessed on 5th March 2016
- planningcommission.nic.in/plans/stateplan/sdr_punjab/sdrpun_ch5.pdf, assessed on 5th March 2016
- jica-ri.jica.go.jp/IFIC_and_JBICI-Studies/english/.../pdf/chapter4.pdf. assessed on 5th March 2016
- www.fao.org/3/a-ah885e.pdf, assessed on 5th March 2016
- [yojana.gov.in/CMS/\(S\(y4dqr55g1m1qhnd4soqih45\)\)/pdf/.../January.pdf](http://yojana.gov.in/CMS/(S(y4dqr55g1m1qhnd4soqih45))/pdf/.../January.pdf), assessed on 5th March 2016
- <https://www.youtube.com/watch?v=LXgyAfnBgWo>, assessed on 5th March 2016
- <https://www.youtube.com/watch?v=jCpEh78M4xE> assessed on 5th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Not Applicable

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S.J. Patil	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. T. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Ms. D. A. Khandare	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5.	M. R. Shelote	Consultant	M.R. Associates, Nagpur
6.	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
7.	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

LEVEL - II

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/AE/MT/PK/TX
LEVEL NAME : BASIC SCIENCE COURSES
COURSE CODE : CA201E
COURSE TITLE : COMPUTER APPLICATIONS
PREREQUISITE : NIL
TEACHING SCHEME : TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE : NIL
PR. TEE : 02 HRs (Internal)
PT. : NIL

❖ RATIONALE:

Engineering students should know the basics of handling the computers. This course describes the basics of word processing, table handling, and power point presentations for the understanding of elementary knowledge related to IT applications. It also describes basics of problem solving using C language, for the understanding of elementary knowledge related to logic development. It is very useful course for understanding the higher level knowledge in the field of IT applications and software engineering.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use various formatting tools available in word processor.
2. Handle spread sheets.
3. Prepare presentation.
4. Draw block diagrams, figures.
5. Use LATEX for writing project report
6. Create static website using HTML

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	• Create new document , open existing document and perform various operations on text like Font setting , delete, select, insert, copy- paste, cut- paste, find and replace.	WORD PROCESSING	2
2	• Perform various page setup operations like paragraph setting, page margin, size, orientation, watermark, page borders.		2
3	• Insert and remove Picture/ Image, Tables, Hyperlink, page break, Headers-Footers, bulleted lists in document.		2
4	• Perform Mail merge operation.		2
5	• Open blank /existing worksheet and perform operations like select, delete, insert, copy- paste, cut- paste, find & replace text / data in cell and range of cells. • Perform various formatting operations like, Data Alignment, Wrap text, merge / unmerge cells, change column width, row height, setting page margin, size, orientation, print area.	SPREADSHEET	2
6	• Insert and remove Picture/ Image, Hyperlink, page break, Headers-Footers, in worksheet. Insert and remove cells, rows, columns. Draw various types of graphs / charts.		2
7	• Perform various Functions like sum, average, count, countif, countblank, min, max, upper, lower, len, trim, left, right, mid, date, day, today, month, year, abs, int, exp, floor, sign, sum, sumif, sqrt and formulae like calculating simple interest, compound interest etc. on data in a worksheet.		4
8	• Sort data in ascending and descending order, on one and more than one field. • Apply Filter and obtain desired information.		2
9	• Create new presentation, add /delete slides, insert / delete tables, word Art, header/footer ,slide number, cliparts, images in slide, hyperlink.	PRESENTATION	2
10	• Apply various slide transition methods; apply animation effect, setup slide show, for selected slides.		2
11	• Draw diagrams in a slide, using various available shapes, insert / modify/ delete charts in slide.	PRESENTATION	2
12	• Draw block diagrams, circuit diagrams etc. • Save diagrams in jpg/ TIFF formats • Insert saved diagrams in documents	DRAWING TOOL	4

13	• Open LATEX document • Write simple mathematical equations in LATEX document • Insert figures and tables in in LATEX document • Generate the reports using templates	LATEX	4
14	• Create HTML document by using different tags, elements and attributes (any four) • Create HTML document by using various formatting tags (text level and paragraph level). (any four) • Design webpage using nesting list. (using OL, UL and DL)	HTML	4
15	• Add images, tables and text links in created document. • Insert multimedia in webpage using various techniques		4
16	• Set various attributes of tables. • Set various attributes of images. • Create hyperlink to text, image, table content and email.		4
17	• Create HTML document by using frame and frameset tags (any two)		2
18	• Create HTML document by using frame and frameset tags along with various attributes.		2
19	• Create HTML document by using form and its elements (any two)		2
20	• Create login form and set password.		2
21	• Create static website using all above HTML facilities. (MINI PROJECT)		8
Skill Assessment			4
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Nil

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Activities	20
2	Performance	20
3	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	3	3	-	-	-	3	3	3	-	-
2	3	-	3	3	-	-	-	3	3	3	-	-
3	3	-	3	3	-	-	-	3	3	3	-	-
4	3	-	3	3	-	-	-	3	3	3	-	-
5	3	-	3	3	-	-	-	3	3	3	-	-
6	3	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	World wide web designing with HTML	C. Xavir	13: 9780074639719
2.	HTML5 for Publishers	Sanders Kleinfeld	10/ASIN: B005ISQ7JM
3.	HTML5 for Web Designers	Jeremy Keith	10/ASIN: 0984442502

❖ **E-REFERENCES:**

<http://www.w3schools.org.in>, accessed on 11th April, 2016
<https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf> accessed on 11th April, 2016
<https://www.latex-tutorial.com/tutorials/> accessed on 11th April, 2016
<http://www1.maths.leeds.ac.uk/LaTeX/TableHelp1.pdf> accessed on 11th April, 2016
http://www.tutorialspoint.com/html/html_frames.htm accessed on 21st April, 2016
showmedo.com/videotutorials/openoffice accessed on 29th April, 2016
www.tutorialsforopenoffice.org accessed on 29th April, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Computer (Dual CORE and above)
2. Network printer.
3. Office Suite.
4. LATEX.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. S.P. Lambhade	Head of Computer Engineering	Government Polytechnic, Nagpur.
2.	Dr. Mrs. A.R. Mahajan	Head of Information Technology	Government Polytechnic, Nagpur.
3.	V.A. Raje	Lecturer in Computer Engineering	Government Polytechnic, Nagpur.
4.	Dr. A.R. Mahajan	Head of Information Technology	Government Polytechnic, Nagpur.
5.	L.D. Vilhekar	Lecturer in Information Technology	Government Polytechnic, Nagpur.
6	Shri. Atul Upadhyay	CEO	Vista Computers , Ram Nagar, Nagpur
7	Shri. N. V. Chaudhari	Asst. Professor (CSE)	DBACEO, Wanadongri, Nagpur
6	Shri. Manoj Jethawa	HOD Computer Science	Shri Datta Meghe Polytechnic, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/IT/CM /MT/PK/AE/TX
LEVEL NAME	: BASIC SCIENCE COURSES
COURSE CODE	: PH201E
COURSE TITLE	: ENGINEERING PHYSICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

Engineering physics is an essential part of the educational system and of an advanced society, therefore this course essentially required for engineering courses. The different streams of physics provides fundamental facts, principals and laws are very helpful in having better understanding of the other technology courses which contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries. Physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about Nature.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the principal and laws of Physics on physically observable things to their respective disciplines.
2. Illustrate broad ideas about different physical phenomena.
3. Apply fundamental physics in various Engineering fields.
4. Select proper measuring instruments on the basis of range and least count to measure the physical quantities.
5. Calibrate different measuring instruments.
6. Handle instruments carefully to avoid any type of devastation.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. General Properties of solids	1. Relate Deformation in bodies by the action of external forces. 2. Identify least count and range of instruments. 3. State hook's law of elasticity. 4. Define different terms related to elasticity. 5. Differentiate accuracy and precision. 6. Describe the types of modules of elasticity. 7. Illustrate the Searle's apparatus. 8. Solve the numerical based on Elasticity.	1.1 Elasticity, Plasticity, Rigidity. Deformation in bodies by the action of external forces, Stress and Strain with their types, Elastic Limit, Hook's Law, yield point, factor of safety, breaking stress, ultimate stress. Applications of elasticity. Types of modulus of Elasticity with relation between them. 1.2 Searle's method to find out Young's modulus of elasticity. Least count and range of instruments: Vernier caliper, outside micrometer screw gauge, Travelling microscope. (Numerical based on above)	06
2. General Properties of liquids	1. Define the terms related with general properties of liquid. 2. State the factors affecting surface tension and viscosity. 3. Select the laws of viscosity to find the coefficient of viscosity of freely falling body. 4. Classify the types of flow of liquid with significance of Reynold's number. 5. Illustrate the phenomenon of Capillarity and angle of contact of liquid and glass. 6. Solve the numerical based on general properties of matter.	2.1 Surface Tension, Factors affecting surface tension, Molecular force, cohesive and adhesive force, Angle of contact with its significance and capillary action (no derivation), Effect of impurity and temperature on surface tension. Application. (Numerical based on above) 2.2 Viscous force, Definition of viscosity, Newton's law of viscosity, Reynolds's number and its significance, critical velocity, streamline flow, turbulent flow, Stoke's law, statement and formula (no derivation), Coefficient of viscosity and S.I. unit. Application. (Numerical based on above)	08
3. Transmission of heat and Gas laws	1. List the modes of transmission of heat. 2. Define the terms related to expansion of solid due to heat. 3. State the laws related to gas and specific heat. 4. Describe Mayor's relation. 5. Apply the adiabatic and isothermal expansion for bulk modulus of elasticity. 6. Solve the numerical related to gas laws and heat.	3.1 Heat: Three modes of transmission of heat- conduction, convention, radiation. Good and bad conductor of heat with examples, Law of thermal conductivity and S.I. units, Coefficient of linear, aerial and cubical expansion, relation between them (no derivation). (Numerical based on above) 3.2 Boyles law, Charle's law, Gay Lussac's law, absolute zero temperature, Kelvin scale of temperature, General gas equation (statement only), two specific heats	10

		of gases, relation between them, Mayer's relation. . Isothermal process and adiabatic process(Numerical based on above)	
4. Wave motion and Acoustics	1. Define different terms related to Acoustics. 2. Reproduce the formula for velocity of sound with end correction. 3. Classify the different types of wave by their characteristics. 4. Recognize sound absorbing textile material. 5. Describe the phenomenon of resonance with examples. 6. Describe the Doppler effect and Sabine's formula. 7. Implement the conditions for good acoustics in auditorium. 8. Solve the numerical related to wave motion and acoustics.	4.1 Definition of wave motion, amplitude, period, frequency & wavelength, relation between velocity, frequency & wavelength. Progressive wave, Stationary waves, longitudinal and transverse wave. Node, Antinode. forced and free vibration, definition of resonance with example, procedure to find resonance with the help of tuning fork. Formula for velocity of sound with end correction, various factors which depends on it.(Numerical based on above) 4.2Introduction to Doppler Effect and its applications. Echo, Reverberation, Reverberation Time. Absorption coefficient of material, Sabine's formula for reverberation time, Factors affecting the Reverberation of time and acoustics of building. Sound absorbing materials. (Numerical based on above)	14
5. Modern Physics	1. Define the terms related to topics in modern physics. 2. List the properties applications of LASER. 3. State the characteristics of photo electric effect. 4. State the applications related to X-ray, LASER, and photo cell. 5. Implement the photoelectric effect to develop photocell. 6. Illustrate the construction and working of Ruby LASER 7. Describe the production of X-rays. 8. Solve the numerical base on Photo-electricity and X-rays.	5.1 Photon, properties of photons, Planck's hypothesis, Threshold frequency, threshold wavelength and work function, Photoelectric effect with characteristics properties. Principle, Construction and working of Photoelectric cell with applications. Einstein's photoelectric equation. (Numerical based on above) 5.2 Properties of laser, Types of laser, absorption, spontaneous and stimulated emission. Definition of Pumping and its type, Population inversion, Metastable state. Ruby laser: Principle, construction and working. Applications of LASER in Engineering and biomedical Engineering. 5.3Introduction to X-rays, Properties of X-rays, production of X-ray using Coolidge tube. Formula for Minimum wavelength of X-rays, Applications of X-rays in Engineering, medical and scientific field.(Numerical based on above)	18

6. Optical Fiber and Nanotechnology	1. Define the terms related to Optical fiber and nanotechnology. 2. Draw the diagram for inner structure of optical fiber. 3. State the applications of Optical fiber and nanotechnology. 4. Clarify the properties of nanoparticles are different than other particles. 5. Describe the principle of optical fiber. 6. Solve the numerical based on optical fiber.	6.1 Optical fiber, Material of Optical fiber. Structure of optical fiber and its types. Principle of Optical fiber-total internal reflection. Acceptance angle, Numerical aperture. Applications of Optical Fiber.(Numerical problems) 6.2 Definition of nanoscale, nanometer, nanoparticle, nanostructured materials with examples, Application of nanotechnology in Engineering and Technology, medical, cosmetics, environmental, space and defense.	08
Total Hrs.			64



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Pract-icals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various instruments used in Physics laboratory and follow precautionary measures.	General Properties of solids	2
2	Determine least count and range of Vernier Caliper, Outside micrometer screw gauge and calculate its zero error.		2
3	Calculate the diameter of a small spherical body by Outside micrometer screw gauge.		2
4	Measure the outer diameter of a cylindrical body by Vernier Caliper.		2
5	Calculate the value of Young's modulus of elasticity of given wire and identify the type of material from standard value.		2
6	Find rise of liquid in capillary tube and compute surface tension of liquid.	General Properties of liquids	2
7	Compose the relation between terminal velocity and radius of spherical body with different materials passing through the liquid.		2
8	Find the most viscous fluid from given fluids by calculating coefficient of viscosity.		2
9	Analyze the effect of volume on pressure at constant temperature.	Transmission of heat and gas laws	2
10	Calculate mechanical equivalent of heat, J by electrical method.		2
11	Determine inner diameter of resonance tube using Vernier Caliper.	Wave Motion and Acoustics	2
12	Find the velocity of sound with the help of resonance tube. OR Determine the unknown frequency of tuning fork by sonometer.		2
13	Measure the angle of divergence of Laser.	Modern Physics	2
14	Find total internal reflection of light by pin method. OR Calculate the surface area (SA), volume (V) and SA/V of an object and measure dimensions required for it.	Optical Fiber and Nanotechnology	2
Skill Assessment			4
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	General Properties of solids	06(00)	00(04)	00(00)	06(04)
02	General Properties of liquids	02(00)	08(06)	00(00)	10(06)
03	Transmission of heat and gas laws	02(00)	04(04)	06(04)	12(08)
04	Wave Motion and Acoustics	04(04)	04(02)	06(00)	14(06)
05	Modern Physics	02(04)	10(04)	06(00)	18(08)
06	Optical fiber and Nanotechnology	02(02)	08(00)	00(06)	10(08)
	Total	18(10)	34(20)	18(10)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	5	R	2	6	R	2	6	R	2	5/7
	4	U	2																
02	1	R	4	2	U	4	2	U	4	1	U	4	3	U	4				3/5
03	3	U	4	4	R	4	4	U	4	4	R	4	3	A	4				3/5
04	6	U	4	5	U	4	6	U	4	5	R	4	5	U	4				3/5
05	5	A	6	4	A	6	2	U	6										2/3
06	5	U	6	3	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram/figure, selection of equipment's.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	2	-	-
2	3	-	-	-	-	-	-	-	-	2	-	-
3	3	-	-	-	-	-	-	-	-	2	-	-
4	3	-	2	2	-	-	-	2	-	2	-	-
5	3	-	2	2	-	-	-	2	-	2	-	-
6	3	-	2	2	-	-	-	2	-	2	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Modern Physics	B.L. Thereja, S.Chand & Company Ltd 5 th Edition, 2014	13:978-8-12-190163-5
2.	Engineering Physics	V.Rajendran, The McGraw Hill Education Pvt. Ltd, 1 st Edition, 2010	13: 978-0-07-107014-0
3.	Conceptual Physics	P.G.Hewitt, San Francisco Addison Wesley- 10 th Edition, 2006	13: 9780321909107
4.	Engineering Physics	R.K.Gaur And S.L.Gupta, Dhanpatrai Publication New Delhi, 1987	97-8-18-992822-3

❖ **E-REFERENCES:**

<https://www.youtube.com/watch?v=7vT-988yH3M> , assessed on 5th march 2016
https://www.youtube.com/watch?v=XMWcQ4Fn_3I , assessed on 4th march 2016
<https://www.youtube.com/watch?v=6L3Y6UnWe6M> , assessed of 5th march 2016
https://www.youtube.com/watch?v=KjUIKF6_4LI , assessed on 2nd march 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Vernier Caliper (Least count= 0.01 cm and range= 0 to 12 cm)
2. Screw gauge (Least count= 0.001 cm and range= 0 to 2.5 cm)
3. Young' Modulus- Searle's pattern with micrometer reading 0.001 cm.
4. Travelling microscope vertical and horizontal scales with range 0- 15 cm with least count 0.001 cm
5. resonance apparatus with glass tube and metal reservoir (L= 0- 100 cm)
6. sonometer teak wood with length 1m.
7. Tuning fork -256, 320, 384, 428, 480, 512 Hz.
8. Boyle's apparatus iron base double steel rod, 25 ml fitted with leveling screw on base
9. Stoke's apparatus with glass tube 50 cm.
10. Stop watch GEM 1/10 sec.
11. Ammeter (DC, 0-5 Amp)
12. Millimeter (DC, 0-1 Amp. G.E. type D 50)
13. Voltmeter (DC, 0-3V)
14. Rheostat single tube of 6.5 cm dia., 30 cm length, 5 Amp, 18 ohm, provided with Bakelite slider with phosphor, bronze contacts.
15. Joule's calorimeter with mass 198 cal/gms.
16. Laser

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	M. K. Malke	I/C Physics Department	Government Polytechnic, Nagpur.
2.	Dr. K. S. Moon	Associate Professor	Dharampeth M P Deo Memorial Science College, Nagpur
3.	Mrs. Farheen Baig	Assistant Professor	Priyadarshini College of Engineering, Nagpur
4.	Mrs. M.B. Mahaley	HOD, Physics Department	SDMP, Nagpur
5.	Dr. S. B. Raut	Lecturer	Government Polytechnic, Nagpur.
6	Mrs. S.B. Adulkar	Lecturer	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE
LEVEL NAME	: BASIC SCIENCE COURSES
COURSE CODE	: CH 203E
COURSE TITLE	: APPLIED CHEMISTRY
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

Chemistry is the basic science which is essential to all engineering courses. For an engineer, the usage of equipments and instruments would require knowledge of chemical substances, their composition and properties. Chemistry subject knowledge also aims to bridge the theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in the field of engineering.

Study of impurities and hardness in water, softening of water and purification of water will help the students to make proper use of water. Study of Applied chemistry is essential to civil engineering course group. It provides knowledge about the appropriate use of engineering materials, their protection, study of extraction of iron, study of Cement, lime and their usage. This will be gateway for development of reasoning capacity of students and understanding new technology as well.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use principles and basic laws of chemistry in engineering field.
2. Select and apply knowledge of metal and nonmetallic materials in field of engineering and Technology.
3. Select proper construction material on the basis of properties and application.
4. Record readings of experiments.
5. Conclude result of practical on the basis of ultimate stakeholders or society.
6. Safely handle chemicals and equipments which are correlate with safety of others and environmental protection

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1 Chemical Bonding	1. Define terms related to Atomic structure. 2. State postulates of Bohr's Theory. 3. Draw schematic diagram of atom. 4. State all steps of formation of molecules. 5. Review the filling up orbital by Aufbau principle and Hund's rule.	Atomic Structure: 1.1 Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location. 1.2 Postulates of Bohr's Theory 1.3. Definition, Shape of the orbitals & distinction between Orbits & Orbitals. 1.4 Hund's Rule, Filling Up of the Orbitals by Aufbau's Principle (till Atomic no. 30). Valency: 1.5 Definition & types of valency (Electrovalency & Covalency). 1.6 Octet Rule, Duplet Rule. 1.7 Formation of Electrovalent e.g. NaCl, CaCl ₂ , MgO, AlCl ₃ . 1.8 Formation of Covalent Compounds CO ₂ , H ₂ O, NH ₃ , C ₂ H ₂ . 1.9 Distinction between electrovalent & covalent compounds.	10
2. Metallurgy and Alloys	1. Describe the process of extraction of iron from its ore. 2. List applications of pig iron, slag iron, and flue gases. 3. State effects of alloying elements on properties of steels. 4. State application and composition of different steels.	Metallurgy 2.1 Definitions of metallurgy, ores of iron. 2.2 Extraction of pig iron by smelting in Blast furnace with chemical reactions in different zones. Product of Blast furnace 2.3 Composition, properties and applications of pig iron, slag and flue gases. 2.4 Properties and applications of commercial forms of iron-pig iron, cast iron, wrought iron Steels 2.5 Definition of steel. Classification of plain carbon-low carbon, medium carbon, high carbon steel with their properties and application. Alloy steel 2.6 Effect of alloying element C, Ni, CO, V, Mo, W, Cr on properties of steel, 2.7 Composition, properties and application of heat resisting steel, Nicrome, magnetic steel (alnico), 18-8 stainless steel, 18-4-1 high speed steel. Heat treatment of Steels 2.8 Definition and purposes of –Hardening, Tempering, annealing, and Normalizing.	12
3. Non-Metallic Engineering Materials	1. Distinguish between thermo softening and thermosetting plastics. 2. List the properties of Rubber.	Polymers (Plastics, Rubber) 3.1 Definition and types of Plastic, thermo softening and thermosetting plastics. Properties, properties and uses of plastic. 3.2 Formation of Plastic by Addition &	08

	3. State the applications of thermal insulators. 4. Describe applications of Polyethylene & Bakelite.	Condensation process (by giving e.g. of Polyethylene & Bakelite plastic Respectively) Rubber 3.3 Types of Rubber. 3.4 Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanization of Rubber with Chemical Reaction. 3.5 Synthetic Rubber: Definition, difference between natural and synthetic rubber, 3.6 Properties of synthetic rubber such as elasticity, tack, abrasion resistant, their definition and related applications. Insulating material 3.7 Definition & Characteristics of Thermal insulators. Preparation, Properties & Applications of Thermocole & glass wool.	
4 Water	1. List the causes of hardness of water. 2. Describe the method for removing hardness from water. 3. Illustrate adverse effect of hard water. 4. Compare the process of softening of water. 5. Select the process of purification of portable water.	4.1 Types of impurities in natural water. 4.2 Definitions of hard and soft water, causes of hardness, types of hardness, definition, degree of hardness, and units of hardness in ppm and equivalents of CaCO_3, estimation of hardness by EDTA method, Numerical. 4.3 Adverse effects of hard water in: Industries- paper industry, textile industry, dyeing industry, sugar industry. 4.4 Domestic applications: washing, bathing, cooking, and drinking. 4.5 Boilers: boiler corrosion, caustic embrittlement, scale and sludge formation. Water treatment: 4.6 For industrial applications: Principle, diagram, working, chemical reactions, regeneration, advantages-Permutit / Zeolite process and Ion exchange process 4.7 For domestic applications: Water quality parameters for potable water, treatment of water for domestic application by screening, sedimentation, Coagulation, filtration, sterilization. 4.8 Chlorination method of sterilization- using chlorine gas, bleaching powder, chloramines. 4.9 For sea water: Desalination of sea water by reverse osmosis.	16
5 Cement and Lime	1. Select appropriate materials used in construction. 2. Describe the properties of cement and lime. 3. Mention the Applications of cement and lime.	Cement : 5.1 Portland cement: Definition, chemical composition, average compound, composition, functions of constituents. 5.2 Setting and hardening of Portland cement with chemical reactions function of gypsum in cement.	10

		5.3 Special Cements: Properties and application of water proofing cement, super sulphate cement, plaster of Paris. 5.4 Mortar and Concrete: Definition, formation, properties and applications. Lime 5.5 Definition, formation, properties and uses of quick lime, slaked lime, hydrated lime. 5.6 Classification of lime: Composition, properties and uses of fat lime, lean lime.	
6. Corrosion	1. State mechanism of atmospheric corrosion and immersed corrosion. 2. Describe different methods of protection of metal from corrosion. 3. Select proper protection method for different types of material from corrosion.	6.1 Definition of corrosion, Types of corrosion, mechanism of Atmospheric or chemical corrosion. Effect of oxide film on atmospheric corrosion. Factor effecting atmospheric corrosion. 6.2 Immersed Corrosion or Electrochemical Corrosion, definition, types and mechanism (Hydrogen evolution and oxygen absorption) 6.3 Factors Affecting Electrochemical Corrosion 6.4 Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, 6.5 Controlling the External Conditions 6.6 Application of Protective Coatings like metal coating by - Galvanizing, Tinning, Sherardizing Metal Spraying, Metal Cladding, Cementation or Diffusion Method. 6.7 Application of non metallic coatings: paint- definition, characteristics, constituents of paint and their functions.	08
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Pract-icals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Explore the chemistry laboratory.	Chemical Bonding	02
2	Determine the percentage of Iron in given steel sample by Redox titration.	Metallurgy and Alloys	02
3	Find the relation between loss in weight of aluminium strip in acidic and alkaline medium and rate of corrosion.	Corrosion	02
4	Determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution.		02
5	Determine thinner content in oil paint. OR Detect types of corrosion mechanism on the basis of labeled diagram of Mechanism of electrochemical corrosion (Hydrogen evolution and Oxygen absorption)		02
6	Determine total hardness (permanent and temporary) of given sample of water by EDTA method.	Water	02
7	Determine chloride content in given sample of water by Mohr's method.		02
8	Determine the percentage of calcium content in cement OR Select proper type of cement on the basis of its engineering applications (a. water proofing cement b. super sulphate cement, c. plaster of Paris.)	Cement	02
9	Determine the alkalinity of given sample of water.	Water	02
10	Prepare Phenol formaldehyde resin used in manufacturing of Bakelite Plastic.	Non-Metallic Engineering Materials	02
11	Analyse basic and Acidic Radicals of known salt solution-1 (Confirmatory Test) using qualitative analysis method.	Chemical Bonding	02
12	Analyse basic and Acidic Radicals of known salt solution-2 (Confirmatory Test) using qualitative analysis method.		02
13	Analyse basic and Acidic Radicals of known salt solution-3 (Confirmatory Test) using qualitative analysis method.		02
14	Analyse basic and Acidic Radicals of known salt solution-4 (Confirmatory Test) using qualitative analysis method.		02
Skill Assessment			4
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Chemical Bonding:	06(04)	04(04)	00(00)	10(08)
2	Metallurgy and Alloys	02(00)	04(06)	06(00)	12(06)
3	Non-Metallic Engineering Materials	06(00)	04(04)	00(00)	10(04)
4	Water	02(04)	10(02)	06(04)	18(10)
5	Cement and Lime	02(00)	08(00)	00(00)	10(06)
6	Corrosion	00(02)	04(04)	06(00)	10(06)
	Total	18(10)	34(20)	18(10)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	4	U	2	5/7
	6	R	2																
02	1	R	4	1	U	4	2	U	4	1	R	4	1	U	4				3/5
03	3	R	4	3	U	4	4	U	4	3	U	4	4	R	4				3/5
04	5	U	4	5	U	4	6	U	4	4	A	4	6	U	4				3/5
05	2	A	6	4	A	6	2	U	6										2/3
06	4	U	6	6	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing chemical reactions, handling the equipment, writing procedure etc.	10
2	Performance	20
3	Calculation, result, drawing graphs(if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	-	-	-
2	3	2	-	-	-	-	-	-	-	-	-	-
3	3	2	-	-	-	-	-	-	-	-	-	-
4	3	-	3	-	-	-	-	3	-	3	-	-
5	3	-	2	-	-	-	-	2	-	2	-	-
6	3	-	1	-	-	2	-	1	-	1	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Engineering Chemistry	Jain and Jain , Dhanpat Rai publishing company(P) ltd.16 th Edition reprint 2015	978-93-437-07-3
2	A Text book of Engineering Chemistry	S. S. Dara ,S. Chand Publication,15 th Edition	9788121903592
3	Engineering Chemistry	R. Sivakumar , N. Sivakumar and Tata McGraw-Hill, 10 th Edition	9780745-328896
4	Polytechnic Chemistry	Vedprakash Mehta ,Jain brothers, 6 th Edition	13-9788183600134
5	Industrial chemistry	B.K.Sharma, Goel Publication, 8 th Edition	8187224002, 9788187224006

❖ **E-REFERENCES:**

http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_fluids-

assessed on 2 Feb. 2016

<http://www.asetute.com.au/corrosion.html>, assessed on 4 Feb. 2016

http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf, assessed on 4 Feb. 2016

<http://www.galvanizeit.org/aga/animation>, assessed on 6 Feb. 2016

http://www.ehow.com/list_6725219_different-types-metal-cladding.html, assessed on 8 Feb 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Electronic balance (measure up to 0.001 mg)
2. Battery 12 volt
3. Digital multi-meter
4. Rheostat assorted sizes
5. Voltmeter MI 0-150-300 V
6. Ammeter MI 0-5-10 A
7. Electrolytic cell set up
8. Digital PH meter

❖ **LIST OF EXPERS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

Sr. No	Name	Designation	Institute/Industry
1.	Dr. P.J. Sondawale	I/C Chemistry Department	Government Polytechnic, Nagpur
2.	Dr. Mudrika I. Ahmed	Lecturer in Chemistry	Government Polytechnic, Nagpur
3.	Dr. M. S. Rathod	Lecturer in Chemistry	Government Polytechnic, Nagpur
4.	Dr. S. A. Petkar	Lecturer in Chemistry	Government Polytechnic, Nagpur
5.	Mr. S.R. Gaidhar	Lecturer in Chemistry	Government Polytechnic, Gadchiroli
6.	Dr. S. Z. Jadhav	Professor in Chemistry	Institute of Science, Nagpur
7.	Dr. K. A. Nandekar	Lecturer in Chemistry	G.H.Raisoni Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/AU/PK/MT/EE/EC/IT/CM/TX
LEVEL NAME	: BASIC SCIENCE COURSES
COURSE CODE	: MH201E
COURSE TITLE	: ENGINEERING MATHEMATICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH:04; TU: 01; PR:00 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: NIL
PT.	: 01 HR

❖ **RATIONALE:**

The subject is classified under basic sciences and intends to teach students basic facts, concepts and principles of Mathematics as a tool to analyze Engineering problems. Mathematics lay- down the foundation for understanding core Technology subjects.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Develop logical thinking which is useful in comprehending the principles of all other subjects.
2. Use concept of allied angle, compound angle, multiple, and sub multiple angle to solve engineering problems.
3. Use measures of central tendency and measures of dispersion in decision making.
4. Apply matrix method to solve simultaneous equations in two and three variables.
5. Develop intellectual skill by using mathematical concept.
6. Apply laws of logarithm to solve engineering problems.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Logarithm	1. Identify natural and common logarithm 2. Apply laws of logarithm in solving examples	1.1 Definition of logarithm 1.2 Definition of natural & common logarithm 1.3 Laws of logarithm & change of base formula	04
2. Partial fractions	1. Define rational function, proper and improper fraction. 2. Factorize quadratic and cubic polynomial 3. Resolve proper and improper fraction into partial fraction.	2.1 Definition of rational function , proper ,improper fraction and partial fraction 2.2 Resolving proper fraction into partial fraction. 2.2.1 Denominator containing non repeated linear factors 2.2.2 Denominator containing repeated linear factors 2.2.3 Denominator containing irreducible non repeated quadratic factors 2.3 Resolving improper fraction into partial fraction.	06
3. Determinant and Matrix	1. Memorize expansion formula of determinant of order 2 and 3. 2. Find the value of determinant of order 2 and 3. 3. Define various types of matrices. 4. Perform all algebraic operations on matrices. 5. Solve simultaneous equations in two and three variables	3.1 Definition of determinant , order of determinant 3.1.1 Expansion of determinant of order 2 and 3 3.2 Definition of matrix 3.2.1 Types of matrices 3.2.2 Algebra of matrices 3.2.3 Transpose of matrix , ad-joint of matrix and inverse of matrix 3.2.4 Solution of system of linear equations two and three variables by inverse matrix method	14
4. Trigonometry	1. Define allied angle and compound angle. 2. State the formula of multiple angle (2θ and 3θ) sub-multiple angle ($\frac{\theta}{2}$). 3. Verify trigonometric identities. 4. Solve examples using allied angle, compound angle, multiple	4.1 Trigonometric ratios of any angle 4.2 Fundamental identities 4.3 Trigonometric ratios of allied angles 4.4 Trigonometric ratios of compound angles 4.5 Trigonometric ratios of multiple and sub-multiple angles 4.6 Factorization and de-factorization formulae	22

	and sub-multiple angle formula. 5. Solve examples using factorization and de-factorization formula.		
5. Inverse trigonometric functions	1. Define inverse trigonometric functions. 2. Find principle values of inverse trigonometric functions 3. Solve examples of inverse trigonometric functions.	5.1 Definition of inverse trigonometric functions 5.2 Principle values of inverse trigonometric functions 5.3 Relation between inverse trigonometric functions	06
6. Statistics	1. Define mean of data. 2. Memorize formula of mean, combined mean, mean deviation and standard deviation. 3. Find mean and combined mean. 4. Find the range, mean deviation, standard deviation and variance. 5. Find coefficient of variation and compare the consistency	6.1 Measures of central tendency (mean only) 6.2 Combined mean 6.3 Measures of dispersion 6.4 Range, mean deviation, standard deviation 6.5 Variance and coefficient of variation 6.6 Comparison of two sets of observations	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Solve examples using laws of logarithm	Logarithm	01
2	Find partial fraction of proper fraction.	Partial fraction	01
3	Find partial fraction of improper fraction.		01
4	Expand determinant of order 2 and 3.	Determinant and Matrix	01
5	Perform all algebraic operations on matrices		01
6	Find transpose , ad-joint and inverse of matrix		01
7	Solve simultaneous equations in two and three variables		01
8	Verify trigonometric identities.	Trigonometry	01
9	Use allied angle and compound formulae		01
10	Use multiple and sub-multiple angle formulae		01
11	Apply factorization formula to solve examples.		01
12	Apply de-factorization formula to solve examples.		01
13	Find principle values of inverse trigonometric functions and verify formulae	Inverse trigonometric functions	01
14	Find mean of any data and combined mean oftwo sets ofdata.	Statistics	01
15	Find the range, mean deviation, standard deviation and variance.		01
16	Find coefficient of variation and compare the consistency		01
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Logarithm	00(02)	04(00)	00(00)	04(02)
02	Partial fraction	00(00)	08(06)	00(00)	08(06)
03	Determinant and Matrix	02(00)	08(04)	06(04)	16(08)
04	Trigonometry	06(00)	14(08)	04(04)	24(12)
05	Inverse trigonometric functions	02(00)	04(04)	00(00)	06(04)
06	Statistics	00(02)	12(00)	00(06)	12(08)
	Total	10(04)	50(22)	10(14)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	3	R	2	4	R	2	4	R	2	4	R	2	5	R	2	1	R	2	5/7
	6	R	2																
02	1	U	4	2	U	4	2	U	4	3	U	4	3	A	4				3/5
03	3	U	4	3	U	4	4	U	4	4	U	4	4	A	4				3/5
04	4	U	4	5	U	4	4	A	4	5	U	4	4	U	4				3/5
05	6	U	6	4	U	6	2	U	6										2/3
06	6	U	6	3	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
	NIL	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	2	-	-	-	2	3	-	3	-	-
2	3	3	2	3	-	-	2	3	-	3	-	-
3	3	3	2	3	-	-	2	3	-	3	-	-
4	3	3	2	3	-	-	2	3	-	3	-	-
5	3	3	2	-	-	-	2	3	-	3	-	-
6	3	3	2	3	-	-	2	3	-	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Higher Algebra	Hall & Knight, Publisher: Arihant, 5 th Edition 2015	9352030605
2	Plane Trigonometry	S L Loney, Publisher: Arihant, 5 th Edition 2015	9352030540
3.	Basic Statistics	B L Agarwal, Publisher: Anshan	1848290675
4.	Engineering Mathematics	S.S .Shastry, Prentice Hall Of India, 4 th Edition 2008	978-81-203-3616-2
5.	Fundamental of Statistics	S C Gupta, Himalaya Publishing House, 7 th Edition 2015	9789350517697

❖ **E-REFERENCES:**

<https://www.khanacademy.org/math/algebra>, assessed on March 3, 2016

<https://www.khanacademy.org/math/trigonometry>, assessed on March 3, 2016

<https://www.youtube.com/watch?v=BiLIcCtXmm0>, assessed on March 3, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. S.M. Sayyed	I/C Mathematics Dept.	Govt. Polytechnic Nagpur
2.	Mr. P.T. Khobragade	Lecturer	Govt. Polytechnic Nagpur
3.	Mr. G.R. Dewalkar	Lecturer	Govt. Polytechnic Nagpur
4.	Dr. K. C. Deshmukh	Professor	R. T. M. Nagpur University
5.	Dr. P. B. Bahatkar	Professor	Y. C. C. E. Nagpur
6	Mr. Nasir Khan	Lecturer	Anjuman Polytechnic Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/AU/PK/MT
LEVEL NAME	: BASIC SCIENCE COURSES
COURSE CODE	: MH202E
COURSE TITLE	: APPLIED MATHEMATICS
PREREQUISITE	: MH201E
TEACHING SCHEME	: TH: 04 ; TU:01; PR:00 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR.)
TH. TEE EXAM.	: 03 HRs
PR. TEE EXAM	: NIL
PT. EXAM	: 01 HR

❖ RATIONALE:

Mathematics is the backbone of Technical courses, Understanding of engineering concepts require logical approach and thinking. The course is extension of Engineering Mathematics of first semester and stepping into the prerequisites to learn Calculus and Numerical method. Applied Mathematics lay down the foundation to understand and express principles and laws involved in other Technological subjects.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply mathematical term, concept, principles and different methods for studying engineering subjects.
2. Apply mathematical methods to solve technical problems.
3. Execute management plans with precision.
4. Use mathematical techniques necessary for daily practical problems.
5. Apply concept of extrema in finding maximum profit of production and minimum cost or material needed for production of an article.
6. Apply various numerical method to solve algebraic and simultaneous equations.

❖ COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Functions and Limits	1. Identify various types of functions. 2. Define odd and even function. 3. Find value of any given function. 4. Find limits for all different functions.	1.1 Definition of function, value of a function. 1.2 Types of functions. 1.3 Concept of limit. 1.4 Algebra of limits. 1.5 Limits of algebraic functions. 1.6 Limits of trigonometric functions. 1.7 Limits of exponential & logarithmic functions.	10
2. Derivatives and Applications of derivative	1. State limit definition of derivative. 2. Perform all algebraic operations on derivatives. 3. Find slope, Equation of tangent and normal line of the given curve. 4. Solve examples of maxima and minima.	2.1 Definition of derivative, Notations. 2.2 Derivative of standard functions. 2.3 Rules for differentiation (without proof) 2.4 Derivative of composite functions. 2.5 Derivative of inverse trigonometric functions. 2.6 Derivative of implicit functions. 2.7 Logarithmic differentiation. 2.8 Derivative of parametric functions. 2.9 Second order differentiation. 2.10 Applications: Equation of tangent and normal; Maxima and minima.	16
3. Integration, Definite integration and Applications	1. State Integration by parts theorem. 2. Integrate function using different method. 3. Solve examples of definite integral using properties. 4. Find area using integration method.	3.1 Definition of integration as anti-derivative. 3.2 Integration of standard functions. 3.3 Rules for integration. 3.4 Integration by substitution. 3.5 Integration of rational functions. 3.6 Integration by trigonometric transformation. 3.7 Integration by parts. 3.8 Integration by partial fraction. 3.9 Definition of definite integral. 3.10 Properties of definite integral. 3.11 Applications: Area under the curve, Area bounded by two curves.	16
4. Differential equations	1. State order and degree of D.E. 2. Solve differential equations of first order and first degree. 3. Solve different engineering problems using differential equations.	4.1 Definition of differential equation. 4.2 Order and degree of differential equation. 4.3 Methods of solving differential equations of first order and first degree. 4.4 Variable separable method, reducible to variable separable. 4.5 Homogenous differential equation, exact differential equation. 4.6 Linear and Bernoulli equations.	08

5. Numerical methods	1. Identify the interval of root of algebraic equation. 2. Find the approximate root of algebraic equation. 3. Solve the system of simultaneous equations containing 3 unknowns	5.1 Solution of algebraic equation. 5.1.1 Bisection method. 5.1.2 Regula-Falsi method. 5.1.3 Newton-Raphson method. 5.2 Solution of Simultaneous equations containing 3 unknowns. 5.2.1 Gauss elimination method. 5.2.2 Iterative methods: Gauss-Seidal & Jacobi's method.	14
Total Hrs.			64

B LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Find value of any given function.	1. Functions and Limits	01
2	Find limits algebraic functions.		01
3	Find limits trigonometric, exponential functions.		01
4	Solve examples on derivative using algebraic operations.	2. Derivatives and Applications of derivative	01
5	To find dy/dx of implicit functions.		01
6	To find dy/dx of parametric functions and inverse inverse trigonometric functions.		01
7	Find equation of tangent and normal and solve maxima and minima problems.		01
8	Solve examples using rules of integration and substitution method	3. Integration, Definite integration and Applications	01
9	Solve examples using integration by parts and partial method		01
10	Solve examples using integration by parts and partial fraction method.		01
11	Evaluate definite integral using properties.		01
12	Find area using integration		
13	Solve D.E. using variable separable method and reducible to variable separable.	4. Differential equations	01
14	Solve homogenous, linear and Bernoulli D.E.		01
15	Find the approximate root of algebraic equation.	5. Numerical methods	01
16	Solve the system of simultaneous equations		01
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Functions and Limits	04(00)	08(08)	00(00)	12(08)
02	Derivatives and Applications of derivative	04(00)	08(04)	06(06)	18(10)
03	Integration, Definite integration and Applications	02(00)	08(08)	06(00)	16(08)
04	Differential equations	00(04)	08(00)	00(00)	08(04)
05	Numerical methods	04(00)	12(04)	00(06)	16(10)
	Total	14(04)	44(24)	12 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	1	R	2	2	R	2	2	R	2	3	R	2	4	R	2	5/7
	4	R	2																
02	1	U	4	1	U	4	2	U	4	1	U	4	1	U	4				3/5
03	2	U	4	3	U	4	3	U	4	2	U	4	3	U	4				3/5
04	4	U	4	4	U	4	5	R	4	3	U	4	5	U	4				3/5
05	2	A	6	3	A	6	2	A	6										2/3
06	5	U	6	5	U	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
NIL		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	2	-	-	-	2	3	-	3	-	-
2	3	3	2	3	-	-	2	3	-	3	-	-
3	3	3	2	3	-	-	2	3	-	3	-	-
4	3	3	2	3	-	-	2	3	-	3	-	-
5	3	3	2	-	-	-	2	3	-	3	-	-
6	3	3	2	3	-	-	2	3	-	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Engineering Mathematics-1	P N Wartikar, Pune Vidyarthi Griha Prakashan	4567155742
2.	Calculus of one variable	IA Maron, Publisher: Arihant, 5 th edition 2015	9352030559
3.	Engineering Mathematics	S.S .Shastri, Prentice Hall Of India, 4 th edition 2008	9788120336162
4.	Engineering Mathematics	D.T.Gaikawad, S Chand Publication, 1 st edition 2010	8121933560
5.	Higher Engineering Mathematics	B S Grewal, Publisher: S Chand, 43 rd edition 2014	9788174091955

❖ **E-REFERENCES:**

http://www-math.mit.edu/~djg/calculus_beginners/, assessed on March 3, 2016

<https://en.wikibooks.org/wiki/Calculus>, assessed on March 3, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. M. SAYYED	I/C HOD, MATHS DEPTT.	GOVT. POLYTECHNIC NAGPUR
2.	Mr. T. KHOBRAGADE	LECTURER	GOVT. POLYTECHNIC NAGPUR
3.	Mr. R. DEWALKAR	LECTURER	GOVT. POLYTECHNIC NAGPUR
4.	Dr. K. C. DESHMUKH	PROFESSOR	R. T. M. NAGPUR UNIVERSITY
5.	Dr. P. B. BAHATKAR	PROFESSOR	Y. C. C. E. NAGPUR
6	Mr. NASIR KHAN	LECTURER	ANJUMAN POLYTECHNIC NAGPUR

(Member Secretary PBOS)



(Chairman PBOS)

LEVEL - III

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/CE/PK
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: ME301E
COURSE TITLE	: ENGINEERING GRAPHICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 02; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 04 HRs
PR. TEE	: NIL
PT. EXAM	: 02 HRs

❖ RATIONALE:

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

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
2. Apply the technique of geometrical figure. scale, loci of points for further drawing.
3. Relate the views of an object for drawing orthographic and isometric projections.
4. Visualize three dimensional objects and draw isometric projections.
5. Draw orthographic views , isometric views and freehand sketches
6. Apply knowledge of projections of points and solve the problems on projection of straight lines

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Principles of drawing	1. Use drawing instruments. 2. Use IS SP-46 3. Loci of points from given data. 4. Redraw the given drawing.	1.1 Use of different drawing instruments and equipment 1.2 Types of letters and numbers (single stroke vertical and inclined letters and numbers only) 1.3 Conventions of lines, Dimensioning technique as per IS SP -46 1.4 Scales (reduced, enlarged and full size)- Plain scale, diagonal scale, 1.5 Redrawing 1.6 Loci of points	05
2. Engineering curves.	1. Draw conic sections. 2. Draw involute, cycloid and know their applications. 3. Draw helix , spiral from given data.	2.1 To draw an ellipse by: i) Directrix - focus method ii) Arcs of circles method iii) Rectangle method iv) Concentric circles method 2.2 To draw parabola by i) Directrix - focus method ii) Rectangle method 2.3 To draw hyperbola by i) Directrix – focus method ii) Passing through a given point with reference to given asymptotes iii) Transverse axis focus method 2.4 To draw involute of circle and polygon of maximum six sides 2.5 To draw cycloid, epi-cycloid and hypo-cycloid 2.6 To draw Archimedean spiral & Helix	08
3. Orthographic projections.	1. Visualize, interpret and draw orthographic views from given pictorial views. 2. Use of IS SP-46. for dimensioning technique.	3.1 Introduction to orthographic projections 3.2 First angle and Third angle method of projections 3.3 Conversion of simple pictorial views into orthographic views and dimensioning techniques as per IS SP-46	06
4. Isometric projections	1. Visualize, interpret and draw Isometric views/projections from given orthographic views	4.1 Isometric scales 4.2 Isometric views/projections of simple & cylindrical object (plane surfaces, slanting surfaces, and Rectangular, V, Trapezoidal slots)	06
5. Projection of straight lines	1. Locate the projection of points 2. Draw projection of lines.	5.1 Projections of straight lines inclined to one reference plane and parallel to the other – limited to both ends in first quadrant.	03

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
6. Free hand sketches	1. Sketch proportionate freehand sketches of given machine elements 2. Select proper fasteners and foundation bolts	6.1 Types of threads – Vee and square threads, left hand and right hand threads 6.2 Bolts – square and hexagonal bolts, eye bolt 6.3 Types of nuts – square, hexagonal, wing, capstan, cap, flanged, ring and dome nut 6.4 Locking arrangement – lock or check nut, split pin, slotted nut, castle nut, swan nut and grooved nut 6.5 Foundation bolts- Eye foundation bolt, Rag foundation bolt and Lewis foundation bolt 6.6 Riveted joints – Types of rivets, Single/double riveted Lap and Butt joints	04
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw types of lines, lettering, numbers on sketch book and one problem each of scales, loci of points & two problems of redraw. (01 Sheet)	1.Principles of drawing	08
2	Draw four Engineering Curves, one from topic 2.1, one from topic 2.2, 2.3, one from topic 2.4, 2.5 & one from topic 2.6 of chapter 2 (01 Sheet)	2.Engineering Curves	12
3	Draw one problem using first angle method of projection and another using third angle method of projection (01 Sheet)	3 Orthographic Projections	12
4	Draw one problem with plane surfaces & other with cylindrical, slot, slanting surfaces (using natural scale and isometric scale) (01 Sheet)	4. Isometric Projections	12
5	Draw four problems by using first angle method of projection (01 Sheet)	5. Projections of Straight Lines	08
6	Draw Free Hand Sketches – any ten sketches covering all the topics under chapter 6 (01 Sheet)	6. Free Hand Sketches	12
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Principles of drawing	10(05)	00(00)	00(00)	10(05)
02	Engineering Curves	00(00)	12(06)	00(00)	12(06)
03	Orthographic Projections	00(00)	12(00)	00(12)	12(12)
04	Isometric Projections	00(00)	00(12)	12(00)	12(12)
05	Projections of Straight Lines	00(00)	12(06)	00(00)	12(06)
06	Free Hand Sketches	00(00)	12(08)	00(00)	12(08)
	Total	10(05)	48(32)	12(12)	70 (49)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	5	1	R	5	1	R	5	-	-	-	-	-	-	-	-	-	2/3
02	2	U	6	2	U	6	2	U	6	-	-	-	-	-	-	-	-	-	2/3
03	3	U	12	3	A	12	-	-	-	-	-	-	-	-	-	-	-	-	1/2
04	4	A	12	4	U	12	-	-	-	-	-	-	-	-	-	-	-	-	1/2
05	5	U	6	5	U	6	5	U	6	-	-	-	-	-	-	-	-	-	2/3
06	6	U	4	6	U	4	6	U	4	6	U	4	6	U	4	-	-	-	3/5

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Drawing Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Sketch Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Drawing Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Drawing sheet, Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Drawing portfolio		Continuous	05	--	Drawing portfolio	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
Nil		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:****For Mechanical Engineering:**

Course Outcomes	Program Outcomes (POs)										PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	–	–	–	–	3	3	–	3	–	–
2	3	3	3	3	–	–	3	3	3	3	–	–
3	3	3	3	3	–	–	3	3	3	3	–	–
4	3	3	3	3	–	–	–	3	–	3	3	–
5	3	3	3	3	–	–	–	3	3	3	3	–
6	3	3	3	3	–	–	–	3	3	3	3	–

For Other Programs:

Course Outcomes	Program Outcomes (POs)										PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	–	–	–	–	3	3	–	3	–	–
2	3	3	3	3	–	–	3	3	3	3	–	–
3	3	3	3	3	–	–	3	3	3	3	–	–
4	3	3	3	3	–	–	–	3	–	3	–	–
5	3	3	3	3	–	–	–	3	3	3	–	–
6	3	3	3	3	–	–	–	3	3	3	–	–

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Bureau of Indian Standards, Third Reprint, October 1998	81-7061-091-2
2.	Engineering Drawing	N.D.Bhatt, Charotar Publishing house 2010	978-93-80358-17-8
3.	Machine Drawing	N.D.Bhatt & V. M Panchal, Charotar Publishing house 2010	978-93-80358-11-6
4	Engineering Drawing	D.A.Jolhe, Tata McGrawHill Edu.2010	978-0-07-064837-1
5.	Engineering Drawing	R. K. Dhawan , S. Chand&co.	81-219-1431-0
6	Engineering Drawing	P. J Shaha, S.Chand&co.2008	81-219-2964-4

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=TJ4jGyD-WCw>, assessed on 25th March 2016
- https://www.youtube.com/watch?v=dmt6_n7Sgcg, assessed on 25th March 2016
- https://www.youtube.com/watch?v=_MQScnLXL0M, assessed on 26th March 2016
- <https://www.youtube.com/watch?v=3WXPanCq9LI>, assessed on 26th March 2016
- <https://www.youtube.com/watch?v=fvjk7PlxAuo>, assessed on 27th March 2016
- <http://www.me.umn.edu/courses/me2011/handouts/engg%20graphics.pdf> , assessed on 27th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- 1) Drawing Board with drawing instruments
- 2) Minidrafter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	O. V. Sarode	I/C, Head of Mechanical Engineering	Government Polytechnic, Nagpur.
2.	M.G. Thote	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
3.	G.H Dahole	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
4.	Er. A.M.Onkar	Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
5.	Shri. G.F.Potbhare	Principal	NIT, Polytechnic, Nagpur
6.	Dr.S.S.Baraskar	Lecturer in Mechanical Engineering	Govt. Polytechnic, Arvi

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/AE/PK/MT/TX
LEVEL NAME : ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE : WS301E
COURSE TITLE : WORKSHOP PRACTICE
PREREQUISITE : NIL
TEACHING SCHEME : TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS : 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE : Nil
PR. TEE EXAM : Nil
PT. EXAM : Nil

❖ RATIONALE:

Workshop Practice is an engineering science course. The knowledge of this course is essential for technician industry to perform his/her duties. Working in workshop develops the attitude of groups working and safety awareness. This course provides industrial environment in the educational institute.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Adapt safety precautions in workshop
2. Read and interpret job drawing
3. Use hand tools for various operations
4. Apply basic techniques in manufacturing processes
5. Operate different equipments/machineries used in basic shops
6. Perform jobs according to drawing

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Observe the demonstration of hand tools, machine Tools and equipments used in Carpentry Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Carpentry	2
2.	Prepare utility job involving related carpentry operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
3.	Observe the demonstration of hand tools, machine Tools and equipments used in Welding Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Welding	2
4.	Prepare utility job involving related Welding operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
5.	Observe the demonstration of hand tools, machine Tools and equipments used in Fitting Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Fitting	2
6.	Prepare One individual job involving related Fitting operations.		8
7.	Observe the demonstration of hand tools, machine Tools and equipments used in Smithy Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Smithy	2
8.	Prepare One individual job involving related Smithy operations.		8
9.	Observe the demonstration of hand tools, machine Tools and equipments used in Plumbing Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Plumbing	2
10.	Prepare One individual job involving related Plumbing operations.		8
11.	Observe the demonstration of hand tools, machine Tools and equipments used in Sheet Metal Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Sheet Metal	2
12.	Prepare utility job involving related Sheet Metal Shop operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
Skill Assessment			4
Total Hrs.			64

Note: Jobs should be Programme specific.

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Jobs, Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Record		Continuous	10	--	Journals	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF JOB EVALUATION:**

S.N.	Description	Max. Marks
1	Job Drawing	5
2	Handling Tools, machineries and its operations	10
3	Dimension Accuracy	20
4	Overall finishing of Job	5
Total		40

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:****For Mechanical Engineering:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	3	3	-	-	3	3	-	3	3	-
2	3	-	3	3	-	-	-	3	3	3	3	-
3	3	-	3	3	-	-	-	3	3	3	3	-
4	3	-	3	3	-	-	-	3	-	3	3	-
5	3	-	3	3	-	-	3	3	-	3	3	-
6	3	-	3	3	-	-	3	3	3	3	3	-

For Other Programs:

Course Outcomes (COs)	Program Outcomes (POs)										PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	3	3	-	-	3	3	-	3	-	-
2	3	-	3	3	-	-	-	3	3	3	-	-
3	3	-	3	3	-	-	-	3	3	3	-	-
4	3	-	3	3	-	-	-	3	-	3	-	-
5	3	-	3	3	-	-	3	3	-	3	-	-
6	3	-	3	3	-	-	3	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	A Course in Workshop Technology	B.S. Raghuvanshi; Dhanpat Rai sons, New Delhi ; 2006, 2011	10-0000017108
2.	Elements of Workshop Technology	Hajra; Choudhary; Media Promoters & Publishers Mumbai, 2009	10-8185099146
3.	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta J.K., R.S. Khurmi S.Chand & Co. New Delhi	81-219-3092-8
4.	Workshop Practice Manual For Engineering Diploma & ITI Students	R K Hegde, Sapna Book House, 2012	13: 9798128005830

❖ **E-REFERENCES:**

<http://books.google.co.oin/books/isbn=9380026757> , assessed on 17th March 2016

<http://www.asnu.com.au/profile/our-process.aspx> , assessed on 17th March 2016

<https://www.youtube.com/watch?v=swnEQ17cQW>, assessed on 17th March 2016

<https://www.youtube.com/watch?v=c-FN4M77qyA>, assessed on 17th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Welding Transformer (Air Cooled) Single Phase
2. Welding Transformer (Oil Cooled) Three Phase
3. Gas Welding Set
4. Bench Drilling Machine
5. Hydraulic Power Saw Machine
6. Bench Grinder
7. Bench Vise
8. Wood Turning Lathe Machine
9. Circular Saw Machine
10. Portable Wood Cutting Machine
11. Portable Drilling Machine
12. Carpentry Vice
13. Pipe Bending Machine
14. Pipe Vice
15. Pipe Cutter
16. Black smith Hearth
17. Anvil
18. Swage Block
19. Sheet Bending Machine
20. Sheet Cutting Machine
21. Brazing Equipment
22. All Hand Tools and Measuring Tools use in Carpentry Shop, Fitting Shop, Welding Shop, Plumbing Shop, Smithy Shop and Sheet Metal Shop,

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	D. C. Satadeve	Workshop Superintendant	Government Polytechnic, Nagpur.
2.	Dr. S. W. Rajurkar	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
3.	Er. A.M.Onkar	Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
4.	Shri. G.F.Potbhare	Principal	NIT, Polytechnic, Nagpur
5.	Dr.S.S.Baraskar	Lecturer in Mechanical Engineering	Govt. Polytechnic, Arvi

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: AM301E
COURSE TITLE	: ENGINEERING MECHANICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 01; PR: 02
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

RATIONALE:

Study of this course develops understanding of effect of force on a body. It helps in analytical and graphical solutions to problem related to forces acting on body. It also helps in understanding concept and application of Equilibrium, friction, centroid and center of gravity. Study of simple machines gives idea about input, output, efficiency and friction of machine. Study of this course is very useful at higher level like strength of materials, Mechanics of structure etc. It helps in forming base for understanding all the courses, which are related to engineering mechanics.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply concept of engineering mechanics in engineering field.
2. Analyze effect of force, friction, centroid and centre of gravity.
3. Solve problems related to force, equilibrium of forces, friction, centre of gravity and simple lifting machines.
4. Prove simple laws of equilibrium of forces.
5. Compute efficiency of different machines.
6. Draw the graphs between load and efforts, load and efficiency.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction of Engineering Mechanics	1.Define terms related to Engineering Mechanics 2. State the units of different scalar and vector quantity.	1.1Definition of engineering mechanics, necessity and Classification of engineering mechanics. 1.2 Definitions: Space, time, particle, body, rigid body, mass, weight, scalar and vector quantity. 1.3Units of measurement (SI units): Fundamental units and derived units.	02
2.Simple lifting Machine	1. Define terms related to simple lifting Machine 2.Describe different types of simple lifting machine 3.State velocity ratio of machines 4. Solve problem related to simple lifting machine	2.1Concept of simple lifting machine, uses of machine, definition of load, effort, mechanical advantage, velocity ratio, efficiency of Machines, reversible and non-reversible machines.. 2.2Ideal machine, friction in machine, law of machine, maximum Mechanical advantage and efficiency. 2.3Velocity ratios of simple axle and wheel, differential axle wheel, Single purchase & double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block, two sheaves and three sheaves pulley block, worm and worm wheel	08
3.Forces	1.Define Terms Related to Force 2. Define terms related to moments 3. Define terms related to graphic statics 4. State Principal of Transmissibility of Force 5. State Law of parallelogram of forces 6. Describe Resolution & Composition of forces 7. Solve problems on forces.	3.1 Concept of force, definition of force, unit of force, effects of force, Characteristics of force. 3.2System of forces. Principle of transmissibility of force. 3.3 Composition of forces & Resolution of forces (Two dimensional), Orthogonal and Non Orthogonal components of a force. Resultant force. Resultant of concurrent, non- concurrent and parallel forces, Law of parallelogram of forces: limitations and its applications 3.4 Definition of moment, sign convention of moments, types of moments. Law of moment, definition of couple, types of couple, properties of couple, Varignon's theorem of moments and its applications 3.5 Introduction to graphic statics, graphical representation of force, Bow's notation, Space diagram, force diagram, polar diagram & funicular polygon.	12

4. Equilibrium	1. Define terms related to Equilibrium 2. State analytical conditions of equilibrium. 2. State Lami's theorem 3. Define terms related to Beam 4. Solve Problems related to Lami's theorem and beam reaction.	4.1 Definition of equilibrium, analytical conditions of equilibrium, free body diagram 4.2 Lami's Theorem: limitations and its applications. (Simple problems, no problems on spheres put in container). 4.3 Equilibrium of concurrent, non-concurrent and parallel forces. Definition of Beam, span, types of beams, types of supports, types of loading: point load and UDL. Analytical method to calculate reactions at support for point load and UDL on simply supported and overhanging beams	10
5. Centroid & Centre of gravity	1. Define centroid and center of gravity 2. State centroids of plain regular figures. 3. Locate centroid of two different geometric areas 4. Solve problems related to compound figures. 5. State the centre of gravity solid bodies 6. Locate c.g of two different solid bodies 7. Solve problems related to compound figures	5.1 Definition of centroid and centre of gravity, difference between centroid and centre of gravity. Locating centroids of regular figures such as triangle, rectangle, circle, semi circle, quarter circle. (No Derivations). 5.2 Locating centroid of compound figures, having combination of two different geometric areas only. 5.3 Centre of gravity of solid bodies like cylinder, cone, sphere and hemisphere. 5.4 Locating centre of gravity of compound bodies having combination of only two different geometric shapes	08
6. Friction	1. Define terms related to friction 2. State laws of friction 3. Apply concept of friction 4. Solve problems related to friction	6.1 Concept of friction and its importance in engineering, types of friction, laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. 6.2 Equilibrium of bodies on level surface subjected to force parallel and inclined to plane & inclined plane subjected to force parallel to the plane. (No ladder friction).	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Find the M.A., V.R., Efficiency of and law of machine for simple /Differential Axle and Wheel	Simple lifting Machine	2
2	Find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack		2
3	Find the M.A., V.R., Efficiency and law of machine for Two Sheave Or three sheave Pulley Block		2
4	Find the M.A., V.R., Efficiency and law of machine for Single purchase Crab Or Double purchase Crab		2
5	Find the M.A., V.R., Efficiency and law of machine for Worm and Worm Wheel		2
6	Find unknown force using law of polygon of forces.	Forces	2
7	Find forces in the members of jib crane by using triangle law of forces.		2
8	Determine resultant of co-planer concurrent forces by graphical method. (Any two problems)		4
9	Determine resultant of co-planer non Concurrent Forces by graphical method. (Any two problems)		4
10	Find angle between three concurrent forces using Lami's Theorem.	Equilibrium	2
11	Find equilibrium of parallel forces using beam reaction apparatus.		2
12	Determine beam reaction for Vertical Point Load and UDL. (Any two problems)		2
13	Compare co-efficient of Friction between different surfaces such as Wood and wood, Wood and glass, Wood and metal.	Friction	2
Skill Assessment			2
Total Hrs.			32
Tutorials			
1	Forces, Equilibrium, simple lifting machine		08
2	Friction, Centroid and centre of gravity		08
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	04(02)	00(00)	00(00)	04(02)
02	Simple Lifting Machine	02(00)	08(04)	00(04)	10(08)
03	Forces	02(00)	12(04)	06(06)	18(10)
04	Equilibrium	02(00)	08(00)	00(06)	10(06)
05	Centroid And Centre Of Gravity	00(00)	04(04)	06(00)	10(06)
06	Friction	00(02)	04(08)	12(00)	16(06)
	Total	10(04)	36(20)	24 (16)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	1	R	2	2	R	2	3	R	2	4	R	2	1	R	2	5/7
	6	R	2																
02	2	U	4	2	U	4	4	U	4	2	U	4	2	A	4				3/5
03	3	U	4	3	U	4	3	U	4	3	U	4	5	U	4				3/5
04	4	U	4	5	U	4	6	U	4	6	U	4	6	U	4				3/5
05	3	A	6	5	A	6	3	A	6										2/3
06	6	A	6	6	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing figure of simple lifting machine and force diagram, selection of equipment's. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	PSO 1	PSO 2
1	3	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-
4	3	-	3	3	-	-	3	3	-	-	-	-
5	3	-	3	3	-	-	3	3	-	-	-	-
6	3	-	3	3	-	-	3	3	-	-	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Applied Mechanics	R.S. Khurmi, S.Chand & Co. New Delhi, 2014	10:8121916437 13:9788121916431
2.	Engineering Mechanics	Sunil Deo, Label Book Publishers New Delhi, 2014	10:9381595550 13:978-9381595558
3.	Engineering Mechanics	Basu, Tata Mcgraw Hills, 2013	10:125906266X 13:978-1259062667
4.	Engineering Mechanics	S Ramamrutham, S Chand & Co. New Delhi, 2008	8187433515 9788187433514
5.	Static and Straight of Materials	U.C. Zindal Asian Book Pvt. Ltd New Delhi, 2008	10:8184120737 13:9788184120730

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=-JG9IEqRzQ4>, assessed on 28th March 2016
- <https://www.youtube.com/watch?v=4V1hh6sGkrI>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=EcPGKLUe04I>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=ndT35aqDfAQ>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=W9UDs-kSR0g>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=kuAfu0fZOLw>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=PO5EL9TB-v4>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=Bx-mMA6k8u4>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=9XtGJXVnQxk>, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=k37FJHbSQA8>, assessed on 30th March 2016
- https://www.youtube.com/watch?v=6_D6jjQcAFU, assessed on 30th March 2016
- <https://www.youtube.com/watch?v=AOkeQMMsSrc>, assessed on 30th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- | | |
|---|----|
| 1. simple /Differential Axle and Wheel | 01 |
| 2. Simple Screw Jack | 01 |
| 3. Two Sheave Or three sheave Pulley Block | 01 |
| 4. Single purchase Crab Or Double purchase Crab | 01 |
| 5. Worm and Worm Wheel | 01 |
| 6. Force table apparatus for law of polygon of forces. | 01 |
| 7. Jib crane by using triangle law of forces. | 01 |
| 8. Lami's Theorem. Force table apparatus | 01 |
| 9. Co-efficient of Friction between different surfaces ,
such as Wood and wood, Wood and glass,
Wood and metal. | 01 |

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur
2.	H. S. Chepey	HOD, Civil Engineering	A.S. T. S., Wardha
3.	A. P. Waghmare	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur
4.	R. D. Mendhe	Lecturer in Applied Mechanics	Govt. Polytechnic, Amravati
5.	R. N. Nibudey	Lecturer in Applied Mechanics	Govt. Polytechnic, Gondia
6.	M. R. Shelote	Consultant	M.R. Associates, Nagpur
7.	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
8.	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	:	ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	:	CE301E
COURSE TITLE	:	BASIC SURVEYING
PREREQUISITE	:	NIL
TEACHING SCHEME	:	TH: 03; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	:	05 (1 TH/TU CREDIT=1CLOCK HR; 1 PR CREDIT=2 CLOCK HRs)
TH. TEE	:	03 HRs.
PR. TEE	:	02 Hrs (Internal)
PT	:	01 HR.

❖ **RATIONALE:**

The knowledge and skill of surveying is a basic requirement for a Civil Engineer to initiate the Civil Engineering Project. He will able to choose appropriate method of surveying to prepare the plans / maps. The survey work and relevant maps / plans are useful to decide the feasibility of the project. Surveying skills are very important for a Civil Engineer. This further will lead the students as professionals / entrepreneur in surveying.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Describe various types of survey and measurement.
2. Compute area of field, corrected bearings using given data.
3. Compute reduced levels and missing data using given data.
4. Carry out chain and cross staff survey and plane table survey.
5. Carry out profile leveling and cross-sectioning.
6. Carry out contouring and plot a map/plan.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Surveys, signs and Symbols	1. Define various types of survey. 2. Identify and draw Sketch of conventional signs and symbols. 3. Compare between Plain and Geodetic survey.	1.1 Definition of survey, Objects of surveys, Uses of surveys. 1.2 Classification of surveys- Primary and Secondary, 1.3 Primary Survey- Plane and Geodetic Surveys, Secondary Survey- Based on instruments used, Nature of field and Objective. Principles of survey. 1.4 Reconnaissance , preliminary, detailed survey. 1.5 Conventional signs and symbols used in survey maps - Wall, Wall & Gate, Road (Foot Path, Metalled & Unmetalled), Cutting, Embankment, Railway line (single & double line), Triangulation station, Traversing station, Bench mark, Garden (flower & fruit), Sand, Tank & Pond, Hedge, tree, Church, Temple, Mosque, Barren land, water line, electric line, telephone line, Crossings (Railway, Road over Railway, Railway over Road, Bridge carrying Railway, Electric pole, Telephone pole, Tunnel, Canal or Stream, Nallah or Natural river etc. Abbreviations used: - LB, TP, EP, PO, TO, PS, DB, RH, IB, TB etc.	06
2. Linear Measurements	1. Define various technical terms related to linear measurements. 2. Identify various instruments related to linear measurements. 3. Describe direct and indirect ranging. 4. Describe length measurements on slopping ground. 5. Compute the true length of measurements.	2.1 Study and use of instruments for linear measurements- Metric chain, Measuring Tapes and its types, Ranging rod, Arrow, Peg, Digital tape, Methods of linear measurements- By pacing, by speedometer, by chaining, by digital tape. DDM, ODM, EDM. 2.2 Ranging- Direct and indirect ranging and procedure, Line Ranger, Code of signals used in ranging, Concept of Leader and Follower.	06

	6. Describe ranging and chaining. 7. Describe concept of leader and follower.	2.3 Chaining -Procedure on plane and sloping ground. Correction of linear measurement for incorrect length of chain/tape. (Simple problems)	
3. Chain And Cross Staff Survey:	1. Define various Tech. Terms. 2. Sketch the index map of field. 3. Describe the instrument. 4. Describe the principle of optical square. 5. Produce the field data in field book. 6. Apply the knowledge of Maths in surveying for obstacles in surveying. 7. Compute the area of a field / piece of land. 8. Describe principle of optical square. 9. Describe offsets. 10. Describe various survey lines with sketch.	3.1 Chain Triangulation – Survey Station and their Selections, Survey lines, Check lines, Tie lines, Base line. Well conditioned and Ill conditioned triangles. Taking offsets, Instruments used in taking offsets – Cross staff & Optical square, Long and Short offsets, Perpendicular and Oblique offsets, Degree of precision in taking offset. 3.2 Obstacles in Chaining: The obstacles in Ranging but not Chaining, The obstacles in Chaining but not ranging, The obstacles in both, Chaining & Ranging. (No numerical problems). 3.2 Chain & Cross Staff survey- Noting on page of field book, Precautions in booking field notes, Recording the observation. Calculation of Areas from cross staff survey, Positive areas and Negative areas, Determination of areas from plotted plans using the field notes. Numericals on determining the area of a field.	08
4. Chain And Compass Traversing	1. Define various Tech. Terms. 2. Describe the instrument. 3. Sketch the bearing. 4. Convert WCB to RB and vice versa. 5. Compute included angles. 6. Discover the local attraction. 7. Compute the corrected bearings. 8. Apply the checks on traverse. 9. Develop the traverse from data. 10. Reconstruct the traverse using graphical	4.1 Prismatic Compass – Component parts, construction and use, Comparison with Surveyors compass. 4.2 Principle of Compass survey- Technical Terms – True bearing, Magnetic bearing, and Arbitrary bearing, Whole Circle Bearing, Quadrantal Bearing (Reduced Bearing), Conversion of bearings (Numerical problems). 4.3 Fore bearing, Back bearing, finding Included angles from bearings and calculation of bearings from included angles (Numerical problems). 4.4 Local attraction, Causes,	10

	adjustment.	Precautions and Corrections to bearings affected by Local attraction, calculation of included angles. 4.5 Traversing – Open traverse, Closed traverse, Check on open and closed traverse. Graphical adjustment for closing error. 4.6 Numerical problems on calculation of Bearings, Angles and Local attraction.	
5. Levelling & Contouring	1. Define various Tech. Terms. 2. Relate between axes of theodolite. 3. Describe the instrument. 4. Identify component parts. 5. Compute RLs. 6. Compare between HI and RF method. 7. Produce the data in field book. 8. Compute missing data. 9. Interpret RLs to know topography of land. 10. Sketch contour map. 11. Interpret contour map. 12. Describe classifications of leveling with neat sketch. 13. Describe grade contour. 14. Sketch characteristics of contours.	5.1 Dumpy level – Components, Construction, Fundamental axes and their relationships Line of sight, Line of Collimation, Axis of bubble tube, 5.2 Leveling Staff – Ordinary, Telescopic and Folding type, Temporary adjustments of dumpy level. 5.3 Tech. Terms – Level surface, Level line, Horizontal line, Vertical line, Datum surface, Reduced level, Bench mark and its types. Foresight, Back sight, Intermediate sight, Change point, Height of collimation. Recording in Level book. Permanent adjustments of dumpy level (only relationships). 5.4 Methods of Reduction of level – Height of instrument method and Rise and Fall method. Arithmetical checks, Computation of missing readings (Numerical problems). 5.5 Classifications of leveling – Simple, Differential, Profile, Cross sectional, fly leveling, Sources and Errors in leveling, Precautions and difficulties faced in leveling. 5.6 Study and use of Auto level. 5.7 Contouring – Tech. Terms – Contour, Contour Interval, Horizontal Equivalent. 5.8 Characteristics of contours, Method of locating contours, Direct and Indirect method of contouring, Interpolation of	12

		contours, Establishing Grade contours. 5.9 Uses of Contour Maps. Interpretation of Typical Contour Sheets.	
6. Plane Table Survey:	1. Define various Tech. Terms. 2. Describe the instrument. 3. Compare Compass survey and plane table survey. 4. Construct the traversing. 5. Recommend suitable method of survey for a particular field 6. Describe orientation in plane table survey. 7. Enlist accessories in plane table survey.	6.1 Principles of Plane Table Survey, Accessories required, Setting out of plane table, Leveling, Centering and Orientation, Use of Telescopic Alidade. 6.2 Methods of Plane Table surveying – Radiation, Intersection, and Traversing. 6.3 Merits and Demerits of Plane Table Surveying, situations where Plane Table Survey is used.	06
Total Hrs.			48



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Measure distances on plain and slopping ground using 20m and 30m metric chains, steel and metallic tapes, line ranger. Direct and indirect ranging.	Linear Measurements	02
02	Set out the perpendicular offsets using optical square and open cross staff.	Chain And Cross Staff Survey	02
03	Find areas of given field (positive and negative areas) using Chain and cross staff survey.		04
04	Record fore and back bearings and calculate angles from recorded bearings using prismatic compass.	Chain And Compass Traversing	04
05	Measure and calculate corrected bearings for 5-6 sided closed traverse, identifying stations affected from local attraction, Apply check for included angles, elimination of local attraction.		04
06	Project no 1: (A Whole day Project) Locate details and plot(A-1 size imperial drawing sheet)map using Chain and compass survey for simple closed traverse (5-6 sided) enclosing building. (individual sheet for each student)		08
07	Calculate R.L. by height of instrument method and by Rise and Fall method using dumpy level. Record the reading in level book for differential leveling with arithmetic checks.	Levelling & Contouring	04
08	Set the bench mark by double check method. (at least 500 m away) using dumpy level or auto set level.		04
09	Use auto set level for leveling purpose.		02
10	Project no 2: (A Whole day Project) Draw the map of Profile leveling and cross sectioning at least 600 m with 30 m peg interval. Take Length of cross section 10 m on both sides and spot level at 10 m c/c (or as per site conditions) (Individual sheet for each student).		08
11	Project no 3: Draw the map of Block contouring on A-1 size imperial drawing sheet – (200 x 200 m or as per site conditions) with spot levels at (10 x 10 m). (Individual sheet for each student).		08
12	Perform plane table survey using, Radiation method.	Plane Table Survey	04
13	Perform plane table survey using, intersection method.		02
14	Project no 4: (A whole day project.) Perform traverse survey using plane table enclosing a building. Prepare a map on A-1 size imperial drawing sheet. (Individual sheet for each student).		08
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Surveys, signs and symbols	00(02)	04(00)	00(00)	04(02)
02	Linear Measurements	04(00)	08(08)	00(00)	12(08)
03	Chain And Cross Staff Survey	02(00)	04(00)	06(06)	12(06)
04	Chain And Compass Traversing	02(04)	08(00)	06(06)	16(10)
05	Levelling & Countouring	04(00)	04(08)	06(00)	14(08)
06	Plane Table Survey	02(02)	04(04)	06(00)	12(06)
	Total	14(08)	32(20)	24 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	2	R	2	3	R	2	4	R	2	6	R	2	1	R	2	5/7
	6	R	2																
02	5	R	4	1	U	4	2	U	4	2	U	4	2	U	4				3/5
03	2	U	4	3	U	4	4	U	4	5	U	4	4	R	4				3/5
04	4	U	4	5	U	4	6	U	4	5	U	4	6	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	5	A	6	6	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Field Book	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Determining included angles from bearings using Prismatic Compass.	20
2	Determining Reduce levels and apply check using Levels.	20
3	Viva voce.	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	3	2	-	-	3	-	3	-	-
3	3	-	-	3	-	-	-	3	-	3	-	-
4	3	-	3	3	2	-	-	3	3	3	3	-
5	3	-	3	3	-	-	1	3	3	3	3	-
6	3	-	3	3	-	-	1	3	3	3	3	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Surveying and Levelling	N.N.Basak Tata McGrawHill Education Pvt. Ltd.	13: 978-0-07-460399-4 10: 0-07-460399-X
2.	Surveying and Levelling	R. Agor. Khanna Publishers	13: 978-81-7409-235-9 10:81-7409-235-9
3.	Surveying Vol. 1	Dr. B. C. Punmia, Luxmi Publisher.	10: 8170088534
4.	Surveying Vol. 2	Dr. B. C. Punmia, Luxmi Publisher	10:8170088836
5.	Surveying and Levelling	R. Subramaiam. Oxford Higher Education, Oxford Uni. Press.	10: 0198085427
6	Surveying Theory and Practice	S sBhavikatti, I K International Publishig House Pvt Ltd	10: 9380578253

❖ **E-REFERENCES:**

- https://www.youtube.com/watch?v=chhuq_t40rY, assessed on 14th March 2016
- <https://www.youtube.com/watch?v=P4zM0TYrAQI> assessed on 14th March 2016
- civil.engineering.webservices.utoronto.ca/.../Survey+Camp+Class+Notes..., assessed on 14th March 2016
- giswin.geo.tsukuba.ac.jp/sis/tutorial/fundamentals_of_surveying.pdf, assessed on 14th March 2016
- www.iamcivilengineer.com > ... > Surveying > Surveying and Levelling, assessed on 14th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Chain, Tape, Cross staff, Optical square, Line ranger etc
2. Prismatic Compass
3. Dumpy Level, Auto Level
4. Plane Table with accessories
5. Digital Level

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	T. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	N. U. Sulbhewar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	M. R. Shelote	Consultant	M.R. Associates, Nagpur
6	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
7	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: CE302E
COURSE TITLE	: BUILDING DRAWING
PREREQUISITE	: ME301E
TEACHING SCHEME	: TH: 02; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2CLOCK HR.)
TH. TEE	: 04 HRs
PR. TEE	: NIL
PT	: 02 HRs

❖ RATIONALE:

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

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret the drawings.
2. Illustrate the I.S specifications and standard Bye-laws.
3. Identify Rules, regulation and Bye-laws of local sanctioning authorities.
4. Apply ethics and responsibilities and norms of standard practice in drawing.
5. Use methods and procedures of preparing drawing.
6. Prepare working and submission drawing.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction	1. State the types of line in preparing drawing. 2. Draw various symbols of materials and building components. 3. State scales used for preparing drawing. 4. Define role of various agencies involved in construction work	1.1 Concept for I.S specification for drawing 1.2 Types of Lines – Visible line, Centre line, Hidden line, Section line, Dimension line, Extension line, Pointers, Arrow heads or dots 1.3 Symbols – Materials used in construction, building components 1.4 Scales used for preparing drawing. 1.5 Agencies in construction work 1.6 Role of Owner, Architect, Structural Designer, Contractor, Interior Designer, Specialists. 1.7 Importance of Line Plan	4
2 . Planning Of Residential Buildings	1 List the planning principles used in planning of residential building 2 Define aspect, prospect, grouping, roominess, elegance, circulation, privacy 3 State the importance of orientation. 4 Describe the significance of planning principles in planning of residential building.	2.1 Principals of planning –aspect, prospect, grouping, roominess, elegance, circulation, privacy 2.2 Furniture layout, economy and sanitation 2.3 Orientation 2.4 Other requirements: - Light and ventilation, Climate and its effect, Sun diagram. 2.5 Planning of residential building from given data.	6
3. Plan Sanctioning Procedure And Authorities	1. Name various Plan sanctioning authorities 2. Differentiate role of different Plan sanctioning authorities 3.State Purpose of Bye-laws 4. State procedure of plan sanctioning. 5. Prepare list of documents required for plan sanctioning	3.1 Plan sanctioning authorities- Gram Panchayat, Municipality, Municipal corporation, N.I.T 3.2 Purpose of Bye-laws 3.3 Building rules and Bye-laws of plan sanctioning authority regarding – plot area, side margins, floor space index, floor area ratio, built up area, plinth area, super built up area, minimum height of plinth, sill, Floor to floor height, maximum height of building, no. of storey's, minimum dimension of various rooms and other units such as balcony, passage,	6

		stair case 3.4 Appropriate sizes of various units 3.5 Procedure of plan sanctioning, documents required.	
4. Planning Of Public Building	1.Name common units required for various public buildings 2. State the data required for planning of public building 3. Enlist the Different units required as per function	4.1 Functional design on basis of function or purpose 4.2 Principles of architectural composition (Form, Units, Contrast, Rhythm, Scale.) 4.3 Different unit required as per function 4.4 Appropriate sizes of various units 4.5 Common units required for various public buildings such as Entrance, Sanitary units, Parking space and Telephone booth etc. 4.6 Data required for planning of public building such as Library, Community health center, High school, market, hospital, Post office, Bank, Primary school, canteen, Hostel, shopping mall etc.	6
5. Types of Drawing	1. Draw develop plan from line plan 2. Draw Elevation, Section, Site plan, Location Plan, Foundation plan 3. Prepare Area statement, Schedule of opening, Construction notes and other details 4. Differentiate between Submission Drawing and Working Drawing	5.1 Development of line plan, Elevation, Section, Site plan, Location Plan, Foundation plan, Area statement, Schedule of opening, Construction notes and other details. 5.2 Measured Drawing and its significance 5.3 Submission Drawing and Working Drawing	6
6. Perspective Drawing	1. Define various Terms of Perspective Drawing 2. Describe procedure of perspective view 3. Draw one point perspective view. 4. Draw two point perspective views.	6.1 Introduction- Concept of one point perspective and two point perspective 6.2 Terms associated- picture plane, station point, vanishing point, horizon plane and horizon line 6.3 Procedure for developing one point perspective 6.4 Procedure for developing two point perspective	4
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare line plans of small residential building (two/three rooms + sanitary blocks) for different plot orientation and with different scale on graph paper (A1 size) Sheet no. 1:	1. Introduction & 3. Plan Sanctioning Procedure And Authorities	06
2	Prepare detailed drawing of small load bearing residential building with minimum two rooms, kitchen, sanitary block consisting of plan, elevation, two sections, details of foundation in 1:20 scale, site plan, area statement, schedule of openings, construction notes on A1 size sheet. Sheet no. 2:	2. Planning Of Residential Buildings, 3. Plan Sanctioning Procedure And Authorities and 5. Types of Drawing	16
3	Prepare data Drawing for two storied residential building framed structure type with three rooms at ground floor & sanitary block and minimum two rooms & sanitary block on first floor. The building have partly pitched slab roof. The drawing shall include ground floor plan, first floor plan, elevation, section passing through staircase, W.C. and Both room, details of foundation in 1:20 scale, schedule of openings, site plan, location plan, area statement, construction notes on A1 size sheet (scale 1:100). Sheet no. 3:	2. Planning Of Residential Buildings, 3. Plan Sanctioning Procedure And Authorities and 5. Types of Drawing	16
4	Prepare plan and draw public building from given data. The sheet shall consist of plan, elevation, section, site plan, area statement, schedule of openings, construction notes on A1 size sheet (scale: 100). Sheet no. 4:	4. Planning of Public Building	14
5	Draw line plan of different types of public building such as hostel, library, school, community center, public health center, Post office, bank etc. on graph sheet (A1 size). Sheet no. 5:	5. Planning Of Public Building	08
6	Draw one point and two point perspective of small objects such as steps and pedestal on imperial drawing sheet (A1 size). Sheet no. 6:	6. Perspective Drawing	04
		Total Hrs	64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	02(00)	04(04)	00(00)	06(04)
02	Planning Of Residential Buildings	04(04)	04(00)	00(00)	08(04)
03	Plan Sanctioning Procedure And Authorities	04(04)	04(00)	00(00)	08(04)
04	Planning Of Public Building	02(00)	00(00)	08(08)	10(08)
05	Types of Drawing	00(00)	04(04)	24(00)	28(04)
06	Perspective Drawing	02(00)	00(00)	08(08)	10(08)
	Total 70	14(08)	16 (08)	40 (16)	70 (32)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	3	R	2	3	R	2	4	R	2	6	R	2	2	R	2	5/7
	2	R	2																
02	5	A	8	5	A	10	5	A	6	5	U	4	5	U	4				4/5
03	6	A	8	6	A	8													1/2
04	4	A	8	4	A	8													1/2
05	1	U	4	2	U	4	1	U	4										2/3
06	2	R	4	3	U	4	3	R	4										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Sketch Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Drawing Portfolio		Continuous	05	--	Drawing Portfolio	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	-	-	-	-
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
NIL		

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	3	-	-	-
2	3	-	-	-	-	1	3	-	-	3	-	-
3	3	-	-	-	-	1	3	-	-	-	-	2
4	-	-	-	-	-	-	3	-	-	-	-	2
5	3	-	3	3	-	-	-	3	3	3	-	-
6	3	-	3	3	-	-	-	3	3	3	-	-

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building Drawing and Planning with an Integrated Approach to Built Environment	M.G. Shah, C.M. Kale, V.Y. Patki, Tata McGraw- Hill Publication, 4 th Edition, 2002	10: 0-07-463876-9
2.	Building Planning & Drawing	Dr. N. Kumarswamy, A. Kameswara Rao, Charotar Publishing House Pvt. Ltd. - Anand; 7th Revised Edition, 2013	10: 9380358849 13: 978-9380358840
3.	Civil Engineering Drawing & House Planning	B.P. Verma, Khanna Publications, 2010	8174091688
4.	Civil Engineering Drawing	Gurucharan Singh, Standard Publications, 2009	8180140040
5.	Civil Engineering Drawing	R.S. Malik, G.S. Meo, Asian Publishers/Computech Publication Pvt. Ltd., 2015	10: 8173180024 13: 978-8173180026

❖ E-REFERENCES:

- <https://law.resource.org/pub/in/bis/SO3/is.sp.7.2005.svg.html>, assessed on 18th June 2016
- <https://law.resource.org/.../is.962.1989>, assessed on 28th June 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Drawing Board (D1 size)
2. Mini Drafter
3. Drawing Instruments

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. S.J. Patil	Head of Civil Engineering (I Shift)	Government Polytechnic, Nagpur.
2	Mr. R.N. Giradkar	Head of Civil Engineering (II Shift)	Government Polytechnic, Nagpur.
3	Mr. M.K. Panchawate	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Dr. S. R. Kukadapwar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr. M. R. Shelote	Consultant Engineer	M R Associates, Nagpur
6	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
7	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: CE303E
COURSE TITLE	: CONSTRUCTION MATERIALS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 01; PR: 0 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 01 Hr. (Objective Type Online Examination)
PR. TEE	: NIL
PT	: 15 MINUTES (Objective Type offline Examination)

❖ **RATIONALE** :

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

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1** Identify the basic properties of various engineering materials.
- 2** Identify the sources and method of preparation of different construction materials.
- 3** Suggest the suitable type of construction material for given job.
- 4** Analyze field and laboratory test to be performed for assessing the required quality standard.
- 5** Classify the different constructional materials.
- 6** Conduct market survey for different construction materials.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Lime & Cement	1. Define lime, Quick lime,& Slacked lime 2. Enlist the types of Lime 3. Classify the Lime according to IS classification 4. State sources & constituents of lime stone 5. State the physical properties Cement 6. Identify the constituents of Cement 7. Outline the Flow Chart of manufacturing process of Cement 8. State the Additives to Cement 9. Name the Harmful constituents of Cement	1.1 Definitions of Lime, quick Lime & Slaked Lime 1.2 Types of lime- fat lime, hydraulic lime, poor lime & their uses 1.3 I.S. classification of lime 1.4 Sources of Lime 1.5 Constituents of lime stone 1.6 Physical properties of cement, Constituents of cement & their functions 1.7 Types of cement & their uses Flow chart of manufacturing process of cement-wet process, dry process 1.8 Additives to cement 1.9 Harmful constituents of cement	10
2. Mortar & Concrete	1. Define the Mortar 2. Name the uses of Mortar 3. Classify the Mortar 4. Retrieve the various ingredients of Mortar & their proportions 5. Define the Concrete 6. Name the uses of Concrete 7. Classify the Concrete 8. Name the various ingredients of Concrete 9. State & explain Consolidation of concrete 10. Describe the process of curing of concrete	2.1 Definition of Mortar ,Uses of mortar 2.2 Classification of sand –fine sand , course sand gravelly sand 2.3 Types of Mortar –lime mortar surkhi mortar cement mortar gypsum mortar & their uses 2.4 Functions of sand in mortar 2.5 properties of cement concrete 2.6 Types of Concrete & their uses 2.7 Ingredients of Reinforced cement Concrete & their functions 2.8 Mixing the materials of concrete – Hand mixing, machine mixing 2.9 Compaction-Hand Compaction, vibrators & curing of concrete	10
3. Building Stones & Bricks	1. Classify the Building Stones 2. Identify the characteristics of good Building Stones 3. Describe the purpose of dressing of Stones 4. Enlist the Composition of good brick earth & harmful ingredients in brick earth 5. Classify the Bricks 6. Identify the conventional Bricks & Standard Bricks 7. Describe Concrete blocks 8. List the qualities of Good bricks 9. Enlist & describe the field & laboratory test on bricks	3.1 Types of Rocks-igneous, sedimentary and metamorphic rocks & their uses 3.2 Characteristics of good building stones 3.3 Dressing of stones –Definition & purpose 3.4 Stone quarrying –definition & site selection 3.5 Composition of good brick earth & harmful ingredients in brick earth 3.6 Types of bricks-Burnt bricks, Fly-ash bricks, hollow bricks 3.7 Conventional size in practice, standard I.S. size	12

		3.8 concrete blocks 3.9 Qualities of good bricks-Expected standards 3.10 Field and laboratory test on bricks	
4. Timber	1. Name the uses of Timber in different parts of building 2. Describe the chief varieties of Timber 3. Define seasoning of Timber 4. Explain preservation of Timber 5. Classify the industrial timber 6. List the requirements of good Timber 7. Explain the uses of different industrial timber	4.1 Use of timber in different parts of buildings 4.2 Chief varieties of timbers –Arjun babul , bakul , bamboo, bijasal, ironwood, mango, sal, sissoom, teak etc. 4.3 Seasoning of timber- meaning & objects, types of seasoning. 4.4 Industrial timber-Veneers, plywoods, Block boards, Fiber boards, laminated boards flush door shutters, particle bards, hardboards 4.5 Requirement of good timber	06
5. Finishing Materials	1. Describe the uses of Gypsum plaster 2. List the different plastics & state their uses 3. Attribute the uses of PVC materials 4. Define fibers & name their types 5. List the types of paints & their uses 6. List the types of distemper & their uses 7. List the types of Varnishes & their uses 8. List the types of glass & their uses	5.1 Uses of Gypsum plaster 5.2 Classification of plastics according to i) behavior with respect to heating ,ii) structure iii) physical & mechanical properties 5.3 Resins-thermoplastics. thermosetting 5.4 Uses of P.V.C. materials 5.5 Fiber glass reinforced plastic-properties & uses 5.6 Paint-ingredients of an oil borne paint ,types of paints & their uses, process of painting and uses 5.7 Distemper- properties of distempering, ingredients of distemper, process of distempering, whitewashing & color washing. 5.8 Varnish- characteristics of good varnishes, ingredients of varnish types& their uses process of varnishing. 5.9 Glass- properties of glass, types and their uses	06

6. Flooring Materials & Roofing materials	1. List the types of flooring materials 2. Classify the flooring tiles 3. Identify the common places where the above flooring materials are used 4. Describe industrial flooring 5. List the different types of roofing materials 6. Describe the suitability of different types of Roofing materials	5.10 Types of flooring materials- Stones, Bricks, Cement Concrete (I.P.S.) 6.1 Flooring Tiles-mosaic, glazed, ceramic, marble, granite, vitrified, paving blocks etc. 6.2 Common places where above flooring materials used 6.3 Industrial flooring –importance, materials used. 6.4 Different types of Roofing materials 6.5 Suitability of different types of Roofing materials	04
Total Hrs.			48

B. LIST OF PRACTICALS/ LABORATORY EXPERIMENTS / ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Write a report on market survey of various types of cement, their uses and market rates.	Lime & Cement	04
2.	Write a report on market survey of various types of bricks their uses and market rates.	Building Stones & Bricks	04
3.	Write a report on market survey of types of timber, artificial timber, their uses and market rates.	Timber	04
4.	Write a report on market survey of different flooring materials, their uses and market rates	Flooring & Roofing Materials	04
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Lime & Cement	04(00)	10(00)	00(00)	14(00)
02	Introduction to mortar & Concrete	04(00)	10(00)	00(00)	14(00)
03	Building stones & Bricks	04(00)	04(00)	08(00)	16(00)
04	Timber	02(00)	02(00)	04(00)	08(00)
05	Non-conventional materials & Finishing materials	00(00)	06(00)	06(00)	12(00)
06	Introduction to flooring materials & Roofing materials	04(00)	02(00)	00(00)	06(00)
	Total	18(00)	34(00)	18(00)	70(00)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Bit 7		
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M
01 To 35	1	R	2	1	R	2	2	R	2	2	R	2	3	R	2	3	R	2	4	R	2
	6	R	2	6	R	2	1	U	2	1	U	2	1	U	2	1	U	2	1	U	2
	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	3	U	2	3	U	2
	4	U	2	5	U	2	5	U	2	5	U	2	6	U	2	3	A	2	3	A	2
	3	A	2	3	A	2	4	A	2	4	A	2	5	A	2	5	A	2	5	A	2

T = Unit/Topic Number

L = Level of Question

M = Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Online Exam.	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
NIL		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	-	-	-	-	-	-	-	3	-	-
2	3	-	-	-	2	-	-	1	-	-	-	-
3	3	3	-	-	2	2	-	-	-	3	-	2
4	3	3	-	-	-	2	-	1	1	3	-	2
5	3	3	-	-	-	-	-	-	-	-	-	2
6	3		-	-	-	2	-	1	1	-	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Building Construction	Sushil Kumar, Standard Publication	8186308024, 9788186308028
2.	Building Material	S. K. Duggal, New Age International	978-81-224-2392-1
3.	Material of Construction	D. N. Ghose, Tata McGraw-Hill	0-07-4516477
4.	Concrete Technology	M. S. Shetty	81-219-0003-4
5.	National Building Code	-	1296641295, 9781296641290
6.	Engineering Materials	S. C. Rangwala, Charotar Publishing House	978-93-80358-13-0
7.	Engineering Materials	R. K. Rajput, S. Chand & Co. Ltd	81-219-1960-6

❖ **E-REFERENCES:**

- https://en.wikipedia.org/wiki/List_of_building_materials , assessed on 5th May, 2016
- dir.indiamart.com/industry/builders-hardware.html , assessed on 5th May, 2016
- www.exponent.com > Capabilities , assessed on 5th May, 2016
- www.journals.elsevier.com/construction-and-building-materials/ , assessed on 5th May, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. J. Patil	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	M. K. Panchawate	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Dr. S. R. Kukadapwar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	M. R. Shelote	Consultant Architecture & Structural Designer	Shelote architects & Associates Nagpur.
6	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
7	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: AM302E ^s
COURSE TITLE	: STRENGTH OF MATERIALS
PREREQUISITE	: AM301E
TEACHING SCHEME	: TH: 04; TU: 01; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 06(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ RATIONALE:

Concepts and principles involved in the design of various structures in Civil Engineering are covered in this subject. Design and analysis of structure needs the basic understanding of mechanical properties of material and their behavior under stress. The approach of teaching should develop critical thinking in the students. In laboratory the experiments integrate the knowledge and desired skill in students.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Develop an understanding of the behaviour of material and components subjected to various types of loading
2. Analyse and design engineering problems subjects to various forces.
3. Select appropriate materials considering engineering properties, economy, safety and sustainability.
4. Draw shear force diagram, bending moment diagram, bending stress and shear stress diagrams.
5. Prepare the specimen as per Indian standard (IS) specifications, fix it and operate the machine to carry out the test.
6. Record the readings and the behaviour of material till fracture and analyse its failure pattern

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Simple stress and strain Elastic constants Strain Energy	1 Define various terms and compute their values 2. Calculate Material Properties Under Longitudinal & Lateral Loads 3 Analyse Composite & Compound stress systems 4 Calculate design constants for various conditions. 5 Calculate the change in dimensions and volume of the body subjected to uniaxial, biaxial and triaxial loads/stresses. 6 Calculate the stress, strain due to temperature variation in homogeneous and compound bars. 7 Compute Strain Energy under Different Types of Loading .	1.1 Definition of stress, strain, elasticity. Definition of rigid, elastic and plastic bodies. Deformation of elastic body under various forces. 1.2 Type of stresses-normal and tangential, normal tensile and compressive stresses, standard stress strain curve for mild steel bar under tension test, Hook's law, elastic limit, modulus of elasticity, factor of safety, yield and working stresses. 1.3 Stress and strain in composite section under axial loading. 1.4 Stress and strain due to temperature variation developed in homogeneous and composite bars. 1.5 Longitudinal and Lateral strain, Poisson's ratio, biaxial and triaxial stresses, volumetric strain, change in volume, Bulk modulus. 1.6 Shear stress and strain, modulus of rigidity, complementary shear stress and induced tension and compression due to it. 1.7 Relation between modulus of elasticity, modulus of rigidity and bulk modulus. 1.8 Differentiate between Sudden, Gradual & Impact Loads 1.9 Define Strain Energy, Proof Resilience modulus of resilience. 1.10 Strain energy stored in a body when subjected to gradual, Sudden and impact load	12
2. Shear force & bending moment	1 Define various terms and compute their values 2. Draw Shear Force & Bending Moment Diagram for Statically Determinate Beams. 3 Calculate the shear force	2.1 Type of beams, supports and loads. 2.2 Concept and definition of shear force and bending moment. 2.3 Shear force and bending moment diagram for simply supported, cantilever and over hanging	10

	and bending moment for determinate beams with load combinations of point load and uniformly distributed load. 4 Differentiate shape of shear force diagram and bending moment diagram for point load and uniformly distributed load.	beams subjected to point loads and uniformly distributed loads only. 2.4 Point of maximum sagging and hogging bending moment, point of contra flexure, Relation between load, shear force and bending moment.	
3. Moment of inertia	1 Define various terms and compute their values 2. Compute Moment of Inertia of Symmetric & asymmetric structural sections using parallel and perpendicular axes theorems.	3.1 Definition, M.I. of plane lamina, radius of gyration, parallel and perpendicular axes theorems, M.I. of rectangular, circular, semicircular and triangular section 3.2 M.I. of symmetrical and Unsymmetrical I-section, channel section, T-section, angle section, & Hollow sections and built up section about centroidal axes 3.3 Polar Moment of Inertia of circular sections.	8
4. Bending and shear stresses in beams	1 Define various terms and compute their values 2. Calculate Bending and shear stresses at any location in the beam 3. Design beams based on allowable stresses. 4. Determine the location of maximum and minimum bending and shear stress. 5. Draw the stress distribution diagram. 6. Identify the factors for design of the beam.	4.1 Concept of pure bending, theory of simple bending,. 4.2 Assumption, neutral axis, Bending stresses and their nature, 4.3 Bending stress distribution, 4.4 Moment of resistance 4.5 Shear stress equation. 4.6 Meaning of term used in equation 4.7 Relation between maximum and average shear stress. 4.8 Shear stress distribution for Rectangular, Hollow rectangular, Angle Sections, Channel section, I-Section, T sections and Compound sections. Simple problems based on based on it.	14
5. Columns	1 Define various terms and compute their values 2. Differentiate between short and long columns. 3. Determine the critical and safe loading on the column for different end conditions. 4. Determine the section of long column for the given	4.1 Definition, short column, long column, type of end conditions for Columns, Buckling of axially loaded columns. 4.2 Effective length, radius of gyration, slenderness ratio, Assumptions made in Euler's theory, Euler's buckling load.	8

	conditions	4.3 Rankine's formula used for calculated crippling loads.	
6.Simple plane frames:	1 Define various terms and compute their values 2. Analyse the truss by different methods 3 Draw the Space and vector diagram. 4 Calculate the forces and their nature.	7.1 Introduction. 7.2 Classification of frames 7.3 Assumptions in analysis of frames. 7.4 Method of joints 7.5 Method of section 7.6 Graphical method 7.7 Graphical method Simply supported and Cantilever perfect frames with vertical & inclined loads.	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practic als	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
GROUP A (ATLEAST 2)			
1	Operate Universal testing machine for different types of test.	1. Simple stress and strain	02
2	Measure the elongation of steel by using Extensometer.		02
3	Operate Compression testing machine for compression test.		02
GROUP B (ATLEAST 6)			
4	Perform Tension test on mild steel plane bar.	1.Simple stress and strain	02
5	Perform Tension test on TMT steel.		02
6	Perform Water absorption and Compression test on conventional and fly ash bricks.		02
7	Perform Izod impact test on metals		02
8	Perform Shear test on different metals.	4 bending and shear stresses in beams	02
9	Perform Flexure test on flooring / roofing tile.		02
10	Perform Flexure test on wooden beam.		02
11	Determine the forces in the members of roof truss.	6.Simple plane frames:	02
GROUP C LIST OF DRAWING SHEETS			
12	Draw shear force and bending moment diagrams of different types of beams and loadings. (Four problems on – Two A2 size sheets.)	2 Shear force & bending moment	06
13	Draw the space diagram and force diagram of simple plane frames and determine axial forces in its members (Four problems -Two Cantilever and two Simply supported on Two A2 size sheets)	6.Simple plane frames	08
Skill Assessment			02
Total Hrs			32

C. TUTORIALS:

Sr. No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Stress, strain, module of elasticity of materials, Strain energy stored due to various loading actions.	Simple stress strain ,Elastic constants	04
2	Shear force and bending moment of simply supported, cantilever and overhanging beams.	Shear force and bending moment	02
3	Moment of inertia of regular geometric shapes and built sections	Moment of inertia	04
4	Bending stress and shear stress in various geometric shapes.	Bending stress and shear stress in beams	02
5	Euler's buckling load and Rankine's crippling load in columns.	Columns	04
Total			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Simple stress and strain	04(02)	04(06)	08(00)	16(08)
02	Shear force & bending moment	02(00)	06(08)	04(00)	12(08)
03	Moment of inertia	06(00)	00(00)	00(04)	06(04)
04	Bending and shear stresses in beams	06(00)	06(08)	04(00)	16(08)
05	Columns	04(00)	04(00)	00(04)	08(04)
06	Simple plane frames	00(02)	06(00)	06(06)	12(08)
	Total	18(04)	30(22)	22 (14)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	5	R	2	5	R	2	2	R	2	3	R	2	4	R	2	6	R	2	5/7
	1	R	2																
02	1	R	4	4	R	4	3	U	4	2	U	4	2	U	4				3/5
03	1	U	4	5	U	4	4	A	4	5	A	4	3	A	4				3/5
04	2	A	4	1	A	4	1	A	4	4	U	4	4	U	4				3/5
05	6	A	6	6	U	6	1	U	6										2/3
06	4	U	6	2	U	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing free body diagram, selection of equipment's. writing procedure etc.	20
2	Calculation, Result, Drawing Graphs(if any)	10
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	PSO 1	PSO 2
1	3	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	3	-	1	2	-	-	2	2	2	-	-	-
5	3	-	1	2	-	-	2	2	2	-	-	1
6	3	-	1	2	-	-	2	2	2	-	-	1

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Strength of Materials, Vol. I: Elementary Theory and Problems	S. Timoshenko, CBS; 3rd Edition, December 2004	978-8123910307
2	Mechanics of Materials	Timoshenko Gere Publisher CBS; 2 nd Edition, December 2006	978-8123908946
3	Mechanics of Materials	R.C. Hibbeler, Publisher: Pearson Education; 9 th Edition, 2013	978-9332518605
4	A Textbook of Strength of Materials	Dr. R.K. Bansal: Laxmi Publisher; 5 th Edition, 2012	978-8131808146
5	Strength of Material	R. S. Khurmi, Publisher: S Chand & Co., 2008	978-8121928229
6	Strength of Material	S. Ramamurtham.	818743354X, 9788187433545
7	Mechanics of Structure Vol 1	S. B. Junnarkar, H. J. Shah, Charotar Publishing House Pvt. Ltd., Edition 2012	978-9380358659
8	Strength of Material	Sunil S. Deo, Nirali Prakashan, Edition 29th, 2013	978-9383073283

❖ E-REFERENCES:

<https://youtu.be/67fSwIjYJ-E> assessed on 28th oct. 2016

<https://youtu.be/120kF6fhScA> assessed on 28th oct. 2016

<https://youtu.be/kwQqVBfdIV4> assessed on 28th oct. 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- Universal Testing machine of capacity 400kN, 600 kN/1000kN, analog type/digital type with all attachments and accessories for shear test and flexure test.
- Extensometer with least count 0.01mm, maximum extension 25 mm with single dial gauge/ digital display suitable for various gauge length
- Compression testing machine of capacity 2000KN, analog /digital type having facility to measure deformation with all attachments and accessories.
- Izod/Charpy impact testing machine conforming to IS:1757.
- Tile flexural testing machine conforming to IS:654, capacity 200Kg with uniform loading rate of 45 to 55 Kg/minute provided with lead shots
- Hot Air Oven with thermostatic control having temp. range 100 to 105° C
- Accessories: vernier caliper, meter scale, weighing balance, weights, punch, file, hammer, screw driver, pliers, etc.
- Roof truss model with 8 to 10 members to find forces in members.

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Y.K. Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	Prof. H. L. Wahane	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
3.	Dr. R. R. Ramteke	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
4.	M. R. Shelote	Consultant	M.R. Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
6.	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

LEVEL - IV

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM401E
COURSE TITLE	: THEORY OF STRUCTURES
PREREQUISITE	: AM302E
TEACHING SCHEME	: TH: 04; TU: 01; PR: 00
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: NIL
PT.	: 01 HR

❖ RATIONALE:

Knowledge and understanding theory of structure is very important for civil engineers in order to make civil engineering structures safe and serviceable. Course develops the concept of analysis of structure under various types of transverse or direct loading. Integration of the principles to field problems would help the students to understand the concepts. Students are expected to study about these aspect of analysis and design of various structures so as to develop their understanding in order to apply their knowledge in construction industry

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Evaluate the structure under direct and bending stresses
2. Draw stress distribution diagram in retaining wall and dams under different types of loads
3. Draw different types of beam diagram
4. Analyse slope and deflection of beams under different types of loading
5. Analyse fixed ends moments of fixed beam, continuous beam and portal frames under different types of loading
6. Draw shear force and bending moments diagrams

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1.Direct and Bending stresses	1. Define term related to direct and bending stresses 2.State conditions for no tension, limit of eccentricity, and core section for square, Rectangular and circular section 3. Calculate direct and bending stresses related to short column walls, pillars and chimney subjected to lateral pressure.	1.1 Concept of axial and eccentric load. Eccentricity about one or both Principal axes, stress distribution diagram and nature of stress 1.2 Condition for no tension, limits of eccentricity, Maximum & Minimum stresses, core section for square, Rectangular and circular section 1.3 Short columns, walls, Pillars and Chimney subjected to wind pressure.	10
2 Dams and Retaining walls	1. Calculate direct and bending stresses related to Structures retaining water and earth level up to top 2 State the conditions for stability of dam 3. Calculate direct and bending stresses related to Structures retaining walls.	2.1 Definition of dam and retaining wall 2.2 Maximum and minimum stresses of Rectangular dams and trapezoidal dams with water face vertical 2.3 Conditions for stability of dam. 2.4 Earth pressure on retaining walls active and passive earth pressure 2.5 Rankines theory for active earth pressure	10
3.Slope and Deflection	1.Define term related to slope, and deflection of beam 2. State relation between slope ,deflection and radius of curvature 3. Calculate slope and deflection by double integration and Macaulays method of slope and deflection. of simply supported, overhanging and cantilever beams subjected to concentrated and uniformly distributed load 4. Calculate Propped reaction of cantilevers. 5. Draw shear force & bending moment diagram for rigid prop.	2.1 Concept of slope and deflection, stiffness of beams. 2.2 Slope and deflection of beam subjected to pure bending. 2.3 Relation between slope, deflection and radius of curvature, differential equation (No derivation). 2.4 Double integration and Macaulay's method of calculation of slope and deflection. 2.5.Application to simply supported, over hanging and cantilever beams subjected to concentrated and Uniformly distributed load 2.6 Propped cantilevers, reactions of prop, shear force & bending moment diagram for rigid prop.	10

4 Fixed Beam	1 State advantages and disadvantages of fixed beam 2. Calculate fixed end moments for fixed beam subjected to concentrated load, Uniformly distributed load over entire span or part of span 3 Draw Shear Force & Bending Moment Diagram for fixed beam	3.1 Concept, effect, advantages and disadvantages of fixity, fixed end Moments, nature of fixed end moments, principle of super position. 3.2 Formulae for Fixed end Moments for concentrated load and uniformly distributed load (UDL) on entire span (NO Couple), 3.3 Application in Drawing Bending moment diagram & Shear force diagram for fixed beam subjected to concentrated load, Uniformly distributed load over entire span or part of span	12
5. Continuous Beam	1. Define term related to continuous beam 2. State Clapeyron's theorem of three moments 3 Calculate fixed end moments for Continuous Beam using Theorem of Three Moment 4 Draw Shear Force & Bending Moment Diagram for Continuous Beam using Theorem of Three Moment	5.1 Concept of continuous beam, effect of continuity, nature of moments induced due to continuity, concept of deflected shape. 5.2 Clapeyron's theorem of three moments, application up to three spans only. Supports at the same level, spans may be equal or unequal, Moment of Inertia same for one span and may be different for other span, 5.3 Calculation of Shear force and Bending Moment for concentrated load and Uniformly distributed load on entire span (No couple). The case of fixed ends and over hang is included in application	10
6. Moment Distribution Method	1. Define terms related to moment distribution method 2. Calculate fixed end moment by moment distribution method to various types of continuous beams and portal frames 3 Draw Shear Force & Bending Moment Diagram for continuous beams and portal frames	6.1 Introduction, Sign convention, carry over factor, stiffness factors, distribution factor 6.2 Application of moment distribution method to various types of continuous beam subjected to concentrated load and UDL over entire span for Rigid supports at same level. (No couple) 6.3 Application of moment distribution method to single bay, single story symmetrical portal frames (without sway) Shear force diagram & Bending moment diagram for above application	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Tutorials			
1.	Calculate direct and bending stresses related to short column walls, pillars and chimney subjected to lateral pressure. (10 Problems)	Direct and bending stresses	02
2	Calculate direct and bending stresses related to short column walls, pillars and chimney subjected to lateral pressure.(05 Problems)		02
3	Calculate direct and bending stresses related to Structures retaining water and earth level up to top,(05 Problems)	Damand Retaining wall	02
4	Calculate slope and deflection by double integration and Macaulays method of slope and deflection. of simply supported, overhanging and cantilever beams subjected to concentrated and uniformly distributed load(10 Problems)	Slope and deflection	04
5	Calculate fixed end moments for fixed beam subjected to concentrated load, Uniformly distributed load over entire span or part of span (10 Problems)	Fixed Beam	02
6	Calculate fixed end moments for Continuous Beam using Theorem of Three Moment(10Problems)	Continuous beam	02
7	Calculate fixed end moment by moment distribution method to various types of continuous beams and portal frames(10 Problems)	Moment Disribution	02
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Direct and bending stresses	02(00)	08(00)	04(00)	14(00)
02	Dams and retaining wall	02(00)	04(04)	04(04)	10(08)
03	Slope and deflection	02(00)	04(00)	00(08)	06(08)
04	Fixed Beam	04(00)	06(00)	06(06)	16(06)
05	Continuous beam	00(02)	06(00)	06(06)	12(08)
06	Moment Distribution Method	00(02)	00(00)	12(06)	12(08)
	Total	10(04)	28(04)	32 (30)	70 (38)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	4	R	2	5	R	2	5/7
	6	R	2																
02	1	U	4	1	U	4	1	A	4	2	U	4	2	A	4				3/5
03	2	A	4	2	U	4	3	U	4	3	A	4	3	A	4				3/5
04	4	A	6	4	U	6	4	A	6										2/3
05	5	U	6	5	A	6	5	A	6										2/3
06	6	A	6	6	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF ASSIGNMENT EVALUATION:**

S.N.	Description	Max. Marks
NIL		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSO1	PSO2
	1	2	3	4	5	6	7	8	9	10		
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	3	-	-	-	-	-	--	-	---	--	-
4	-	3	-	-	-	-	-	1	1	-	-	-
5	-	3	-	-	-	-	-	1	1	-	-	-
6	-	3	-	-	-	-	-	1	1	-	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Theory of Structure	R.S.Khurmi, S. Chand & Company, 2015	10:8121905206
2.	Theory of Structure	R.Ramamurtham Dhanpat Rai & Co(P) Ltd, 2015	9782000000037
3.	Theory of Structure	B.C. Punmia, Laxmi Publication 2015	9788170086185
4.	Theory of structure	S.P.Gupta Tata McGraw Hill, 2015	10;0074634984 13;9780074634981
5.	Theory of structure	N.SVazirani, Khanna Publication,	10;8174091424 13;9788174091420

❖ **REFERENCE**

- www.slideshare.net/narendrasinhvadher/sa1-08directandbendingstress
- www.thecivilengg.com/documents/geotech-ebook/RETAININGWALLSa.pdf
- https://en.wikipedia.org/wiki/Macaulay's_method
- https://en.wikipedia.org/wiki/Fixed_end_moment
- <https://www.scribd.com/doc/161479432/Theory-and-Analysis-of-Continuous-Beams>
- www1.gantep.edu.tr/~taysi/The%20Moment%20Distribution%20Method2.ppt

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	A. P. Waghmare	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
5.	A.G.Bhaiswar	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
6.	M. R. Shelote	Consultant	M.R. Associates, Nagpur
7.	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
8.	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM402E ^s
COURSE TITLE	: CONCRETE TECHNOLOGY
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 02; TU: 00; PR: 02(CLOCK HRs)
TOTAL CREDITS	: 03(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (External)
PT.	: 01 HR

❖ RATIONALE:

Concrete is extensively used as a construction material in almost all types of Civil engineering structures like buildings, roads flyovers, dams, bridges and water tanks etc. With advanced construction techniques and use of locally available ingredients of concrete, concrete has become very popular construction material. One of the major job functions of civil engineer is to supervise the concreting work. He has to ensure the quality of concreting work.

The total contents of the course will be useful for ensuring the quality of concrete during design, manufacture, transporting and placing in position of concrete. With good knowledge of concrete materials and the concreting operations one can obtain concrete of desired workability and required strength. It will enable a civil Engineering technician to acquire skills of carrying out various tests on concrete materials and concrete itself along with interpretation of test results.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply properties of concrete and its ingredients in field.
2. Choose the suitable methods of batching, mixing, transporting, compaction and curing of concrete for given conditions.
3. Calculate Proportions of ingredients in concrete mix using IS Method.
4. Conduct tests on concrete and ingredients of concrete to check its quality as per BIS specifications.
5. Conduct Non-destructive testing on concrete.
6. Use equipment and tools required for concreting operations.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Cement and Its properties.	1. Define cement. 2. Describe physical properties of cement. 3. State I.S. specifications of OPC. 4. Detect adulteration of cement at site. 5. Choose type of cement for a given condition.	1.1 Chemical composition of cement. 1.2 Hydration of cement, testing of physical properties of cement like fineness, normal consistency, initial setting time, final setting time, compressive strength and soundness. I.S. Specifications for ordinary Portland cement (OPC). 1.3 Grades of cement, Adulteration of cement, field tests, storing cement at site, effect of storage on properties of cement. 1.4 Various types of cement and their uses, Rapid hardening cement, Low heat cement, Portland Pozzolana cement, Sulphate resisting cement, Blast furnace slag cement, white cement.	05
2.Aggregates And its properties.	1. Define aggregate. 2. Describe properties of Aggregate. 3. Calculate fineness modulus of aggregate. 4. Draw grading curves for aggregates. 5. Relate properties of aggregate with compressive strength of concrete.	2.1 Types of aggregates, manufacturing process of aggregates. 2.2 Properties of fine and coarse aggregates like size, shape, texture, strength, specific gravity, bulk density, water absorption, crushing value, impact value, abrasion value, flakiness and elongation index for coarse aggregate, bulking and silt content of fine aggregates. 2.3 Determination of aggregate grading, sieve analysis and fineness modulus. 2.4 Effect of aggregate properties on strength of concrete.	07
3.Concrete and its properties.	1. Draw Process diagram for concrete. 2. State Duff Abram's water cement ratio law. 3. Draw graph between W/C ratio and compressive strength of concrete. 4. Select W/C ratio. 5. Describe factors affecting Workability. 6. Select workability for	3.1 Introduction to concrete, definition and importance of concrete, process diagram for concrete, properties of concrete in green and hardened state. 3.2 Duff Abram's water cement ratio (W/C ratio) law, effect of W/C ratio on strength, durability and porosity of concrete, selection of Water Cement ratio, quality of water. 3.3 Concept of workability and factors affecting workability, Slump test, Compaction factor test, workability for different works.	05

	different concreting conditions. 7. Describe testing procedure of existing structure using NDT.	3.4 Importance of testing, compression test on concrete, interpretation of test results, introduction to non-destructive testing (NDT) of concrete.	
4. Concrete Mix Proportion	1. Define Mix proportion. 2. Select grade of concrete for given condition. 3. Differentiate Nominal mix and Design mix. 4. Calculate quantity of material for a given mix.	4.1 Grades of concrete. 4.2 Objectives of Mix proportion. 4.3 Information required for mix Proportion. 4.4 Mix proportioning by I.S. method as per I.S.10262-2007.	05
5. Concreting Operations.	1. Differentiate volume and weight batching. 2. Select type of mixer for given condition. 3. Choose method of transportation for given condition. 4. State procedure of placing of concrete. 5. Choose methods of compaction for given working conditions. 6. Describe finishing of concrete 7. Describe curing.	5.1 Batching of cement and aggregates by volume and by weight, introduction to batching plant. 5.2 Mixing concrete ingredients, types of Mixers-Tilting and Non Tilting. 5.3 Transportation of concrete, methods of transportation, precautions to be taken during transportation. 5.4 Placing of concrete, precautions taken during placing concrete in formwork. 5.5 Compaction of concrete, methods of compaction, types of vibrator and precautions to be taken. 5.6 Finishing of concrete, screeding, floating and troweling operations, power float and various pavers. 5.7 Curing of concrete, purpose of curing, methods of curing-spraying water, membrane curing, steam curing, curing by wet gunny bags, ponding methods, chemical curing duration of curing.	06
6. Admixtures and Special concrete.	1. Choose admixture for given condition. 2. Describe types of special concrete 3. Choose type of formwork for given condition. 4. State stripping time of formwork for given condition.	6.1 Admixtures, various types of admixtures, mineral and chemical admixtures. 6.2 Fly-ash concrete, light weight concrete, fiber reinforced concrete, self-compacting concrete, pumped concrete, ready mix concrete (RMC). 6.3 Various types of formworks, stripping Time and precautions.	04
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
GROUP A: CEMENT(Minimum FOUR)			
1	Determine fineness of cement.	Cement and its properties.	2
2	Determine quantity of water for cement paste of normal consistency.		2
3	Determine initial and final setting time of cement.		2
4	Determine compressive strength of cement.		2
5	Determine soundness of cement.		2
GROUP B: COARSE AGGREGATE (Minimum FOUR)			
1	Determine fineness modulus	Aggregates and its properties.	2
2	Determine flakiness and elongation index		2
3	Determine abrasion value		2
4	Determine impact value		2
5	Determine crushing value		2
GROUP C: FINE AGGREGATES (Minimum FOUR)			
1	Determine fineness modulus	Aggregates and its properties.	2
2	Determine bulking of sand		2
3	Determine silt contents		2
4	Determine specific gravity and water absorption		2
5	Determine bulk density		2
GROUP D: CONCRETE (Minimum THREE)			
1	Determine Slump of concrete	Concrete and its properties	2
2	Determine Compaction factor of concrete		2
3	Determine Compressive strength of concrete		2
4	Operate rebound hammer for non destructive test of concrete cube.		2
Skill Assessment			2
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Cement and its properties.	02(00)	08(04)	00(06)	10(10)
02	Aggregates and its properties	02(00)	08(04)	06(00)	16(04)
03	Concrete and its properties.	02(00)	04(04)	06(00)	12(04)
04	Concrete Mix Proportion	02(00)	04(04)	06(00)	12(04)
05	Concreting operations.	02(00)	08(04)	06(00)	16(04)
06	Admixtures and Special concrete.	00(04)	04(04)	00(06)	04(14)
	Total	10(04)	36(24)	24 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	5/7
	6	R	2																
02	1	U	4	1	U	4	2	U	4	1	U	4	2	A	4				3/5
03	2	U	4	3	U	4	4	U	4	3	U	4	4	U	4				3/5
04	5	U	4	5	U	4	6	U	4	5	U	4	6	U	4				3/5
05	2	A	6	3	A	6	1	A	6										2/3
06	4	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Procedure	10
2	Calculation, Result.	10
3	Drawing Graphs.	10
4	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	3
2	-	3	-	-	-	-	-	-	-	3	-	3
3	-	3	-	-	-	-	-	-	-	3	-	3
4	-	3	3	3	-	-	3	3	-	3	-	3
5	-	3	3	3	-	-	3	3	-	3	-	3
6	-	3	3	3	-	-	3	3	-	3	-	3

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Concrete Technology	M. L. Gambhir, Tata Mc Graw Hill, Fifth Edition, 2013	13 :9781259062551 10 :1259062554
2	Concrete Technology	M. S. Shetty, S.Chand and Co, First Edition, 2005	13 : 9788121900034 10 : 8121900034
3	Concrete Technology	S. Bhavikatti, I K International Publishing House Pvt. Ltd, First Edition, 2015	13 : 9789384588670 10 : 9384588679
4	Concrete Technology	A.M. Neville & J.J. Brooks. Pearson Education, First Edition, 2002	13 : 9788131705360 10 : 8131705366
5	Concrete Technology	A.R. Santhakumar, Oxford University Press, First Edition, 2006	13 : 9780195671537 10 : 0195671538
6	I.S: 383 – 1970 Specification for coarse and fine aggregates from Natural sources for concrete.	Bureau of .Indian .Standards.	--

7	I.S: 456 – 2000 Code of practice for plain and reinforced concrete (fourth revision)	Bureau of .Indian .Standards	--
8	I.S: 516 – 1959 Methods of tests for strength of concrete (xii reprint December 1987)	Bureau of .Indian .Standards	--
9	I.S.: 8112- 1989 Specification for 43 grade OPC	Bureau of .Indian .Standards	--
10	I.S: 12269 - 1987 (reaffirmed 1999) Specification for 53 grade O.P.C.	Bureau of .Indian .Standards	--
11	I.S. : 10262 – 1982 Recommended guidelines for concrete mix Design	Bureau of .Indian .Standards	--
12	I.S. 13311 (part-1 and 2) – 1992 Methods of non-destructive testing of concrete part-1 ultrasonic pulse velocity. part-2 rebound hammer.	Bureau of .Indian .Standards	--

❖ **E-REFERENCES:**

- <https://www.nptel.ac.in> , assessed on 10th August 2016
- <https://youtu.be/44yrGm2fxU> ,assessed on 10th August 2016
- <https://youtu.be/NUN9cTAIFdE> , assessed on 10th August 2016
- <https://youtu.be/jZHf90PSaac> ,assessed on 10th August, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- Blaine's air permeability apparatus as per IS: 4031 (part 1)-1999, and sieve no. IS 90 micron - IS Brass Sieve (200 mm dia), 90 Micron size.
- Vicats apparatus- VICAT mould of dia. 80 mm & 40 mm high glass base plate, initial needle, final needle. Consistency plunger M.S. base plate (non porous) of weight 300 gm. Vicat mould split type with camping ring.
- Compression testing machine-2000 kN capacity
- Measuring Cylinder of 1000 ml capacity
- Cement mortar cube vibrator with moulds of size 50 cm²(7.07 cm x 7.07 cm) , 6 nos.
- Measuring Cylinder 1000 ml capacity
- Density basket as per IS specification
- I S sieve set (sizes- 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 μ , 300 μ . 150 μ and pan) , sieve shaker with adaptors
- Aggregate impact testing m/c with mould, Los Angeles abrasion testing m/c
- Elongation gauge and thickness gauge.
- Slump cone (top dia.100mm, bottom dia.200mm, Height 300mm) Compaction factor

test apparatus

- Table vibrator, moulds(150mm x150mmx 150mm)
- NDT apparatus – rebound concrete hammer
- Crushing Value Apparatus
- Compaction Factor Apparatus

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K.Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	S. S. Dikey	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
4.	A. G. Bhaiswar	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
5.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
6.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
7.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM403E
COURSE TITLE	: GEOTECHNICAL ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 02; TU: 00; PR: 02
TOTAL CREDITS	: 03(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

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

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select suitable soil for particular construction
2. Apply soil investigations to use soil as construction material economically
3. Analyze properties and behavior of soil
4. Test soil for determining its engineering properties and parameters..
5. Carryout soil fields test.
6. Prepare report on field visit for testing purpose.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Soil and its physical properties	1. Define different terms related to soil and its properties. 2. Draw phase system diagrams. 3. State relation between various properties. 4. Classify soil based on Indian standard classification method 5. Analyze grain size distribution curve. 6. Calculate different physical properties of soil.	1.1 Definition of soil, Importance of soil in engineering & its necessity. 1.2 Mass of Soil, two and three-phase system, properties like void ratio, porosity, degree of saturation, bulk density, dry density, saturated density, specific gravity and water content and Density index. 1.3 Relation between various properties 1.4 Introduction to swelling pressure in clayey soil eg. (black cotton soil). 1.5 Classification of soil based on Indian standard classification method 1.6 Mechanical analysis – Sieve analysis, grain size distribution curves, characteristic and interpretation, effective size, uniformity coefficient and coefficient of curvature and its significance, well-graded, poorly graded and uniformly graded soil. 1.7 Sedimentation analysis – Stoke's law and principle used in pipette method	08
2. Atterberg's Limits	1. Define different state of limits. 2. Analyze plasticity chart. 3. Describe the procedure of different limits of soils. 4. Calculate plasticity index. 5. List field identification test of soil.	2.1 Different states of soil, liquid limit, plastic limit and shrinkage limit and their determination, plasticity index, liquidity index, consistency index 2.2 Plasticity chart and A-line diagram 2.3 Field identification of soil, dry strength test, dilatancy test and toughness test.	04
3. Permeability	1. Define different terms related to permeability. 2. Apply Darcy's law for finding permeability 3. Describe constant and variable head methods for finding permeability.	3.1 Definition, coefficient of permeability, Darcy's law, typical values of coefficient of permeability for different soil, 3.2 Determination of coefficient of permeability by constant and variable head method, factors	05

	4. Calculate permeability.	affecting permeability.	
4. Shear Strength of Soil	1. Define different terms related to Shear Strength of Soil. 2. Apply Coulomb's law for typical failure envelop of soil. 3. Calculate Shear strength of soil.	4.1 Constituents of shearing resistance of soil, definition of cohesion, internal friction and angle of shearing resistance. 4.2 Coulomb's law and failure envelop. 4.3 Shear strength of soil, Different type of tests; Applicability, Numerical based on it.	05
5. Compaction of Soil	1. Define different bearing capacity of Soil. 2. Compare compaction and consolidation 3. Calculate moisture content and dry density of soil. 4. Describe different types of compaction tests.	5.1 Concept of compaction, consolidation, compression and settlement, difference between compaction and consolidation 5.2 Relation between moisture content and dry density under constant compaction effort, optimum moisture content and maximum dry density. 5.3 Light and heavy compaction tests, factors affecting compaction. Standard Proctor Test 5.4 Field compaction methods, quality control tests, Field density by core cutter, sand replacement.	05
6. Bearing Capacity and Soil Stabilization	1. Define different terms 2. Describe procedure of Plate load test. 3. Describe different methods of soil stabilization	6.1 Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, safe bearing capacity, allowable bearing capacity. Typical values of bearing capacity for common soil as per building codes. 6.2 Plate load test –procedure, set-up, limitations. 6.3 Concept of soil stabilization, necessity of soil stabilization. Different methods of soil stabilization – mechanical stabilization, cement stabilization, bitumen stabilization, fly ash and lime stabilization	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Carryout field identification test on soils.	Soil and its physical properties	02
2	Determine water content of a given soil sample by oven dry method.		02
3	Determine specific gravity of soil by Pycnometer.		02
4	Carryout grain size analysis and plot particle size distribution curve for given soil sample.		02
5	Determine Liquid Limit, plastic limit and plasticity index of given soil sample.	Atterberg's Limits	02
6	Determine shrinkage limit, of given soil sample		02
7	Determine coefficient of permeability by falling head test.	Permeability	02
8	Determination of field density and dry density by core cutter method.	Soil Stabilization	02
9	Determine field density by dry density by sand replacement method.		02
10	Determine Optimum Moisture Content (OMC) and (Maximum Dry Density (MDD by standard proctor test.		02
11	Prepare a report on following video recorded test on soil/ Expert lecture. 1. Unconfined compression test 2. Triaxial shear test. 3. Direct shear test 4. CBR test 5. Vane shear test	Shear Strength of Soil	06
12	Prepare a report on different field test.	All	04
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Soil and its physical properties	02(02)	06(00)	06(06)	14(08)
02	Atterberg's Limits	06(00)	00(08)	06(00)	12(08)
03	Permeability	02(00)	04(00)	06(06)	12(06)
04	Shear Strength of Soil	04(04)	08(04)	00(00)	12(08)
05	Compaction of Soil	02(02)	08(04)	00(00)	10(06)
06	Bearing Capacity and Soil Stabilization	02(00)	08(04)	00(00)	10(04)
	Total	18(08)	34(20)	18 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	5	R	2	6	R	2	1	R	2	5/7
	5	R	2																
02	1	R	4	3	U	4	5	U	4	2	U	4	2	U	4				3/5
03	4	R	4	4	U	4	4	U	4	4	R	4	4	U	4				3/5
04	5	U	4	6	U	4	6	U	4	5	U	4	6	U	4				3/5
05	1	U	6	1	A	6	1	A	6										2/3
06	2	A	6	3	A	6	3	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing diagrams	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	3
2	-	3	-	-	-	-	-	-	-	3	-	3
3	-	3	-	-	-	-	-	-	-	3	-	3
4	-	3	3	3	-	-	3	3	-	3	-	3
5	-	3	3	3	-	-	3	3	-	3	-	3
6	-	3	3	3	-	-	3	3	-	3	-	3

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Soil Mechanics & Foundation	Dr. B. C. Punmia, Er. Ashok Kumar Jain, Dr. Arunkumar Jain, Laxmi Publication 16 th Edition, 2017	8170087910
2.	Geotechnical Engineering: Principles and Practices of Soil Mechanics	V.N.S. Murthy, CRC Press, 2002	10: 0824708733 13: 978-0824708733
3.	Basic Soil Mechanics & Foundations	Alam Singh, CBS Publisher, 2015	9788123901275
4.	IS: 2720 Method of Tests for Soils	Bureau of Indian Standards	-
5.	IS 1498 (1970): Classification and identification of soils for general engineering purposes [CED 43: Soil and Foundation Engineering]	Bureau of Indian Standards,	-

6	IS 1888 (1982): Method of load test on soils [CED 43: Soil and Foundation Engineering]	Bureau of Indian Standards,	-
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❖ **E-REFERENCES:**

<http://nptel.ac.in/courses/105103097/web/chap9final/s4.htm> , assessed on 2nd September, 2016

<https://www.youtube.com/watch?v=QLI9SSv2GIg> , assessed on 2nd September, 2016

<https://youtu.be/6Z1JrhdD1M>, assessed on 2nd September, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Liquid limit device as per IS:2720 (part 10), IS:9259.
2. Sieve set as per IS:460, ISS perforated plate, GI frame, sieves 45cm diameter, aperture size 80mm to 2mm with pan and cover.
3. Brass sieves 30cm diameter aperture size 10mm to 38micron with cover and pan.
4. Motorized sieve shaker with adaptor for 30cm and 45cm diameter.
5. Laboratory permeability apparatus falling head method as per IS:2720 (part 17), IS:11209.
6. Core cutter as per IS:2720 (part 29) with cylinder, dolly, rammer etc.
7. Electronic weighing balance capacity 300g to 01g pan size 290*210mm.
8. Electronic weighing balance capacity 20kg to 0.01g pan size 116mm.
9. Laboratory electric dry air oven thermostatic control range 50 deg. To 250 deg., size 600*600*600mm.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur
2.	S.S. Dikey	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur
3.	A.G. Bhaiswar	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur
4.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
6.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM404E^s
COURSE TITLE	: DESIGN OF RCC STRUCTURE
PREREQUISITE	: AM302E
TEACHING SCHEME	: TH: 03; TU: 01; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 06(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 04 HRs
PR. TEE	: 01 HRs (External)
PT.	: 01 HR. 30 MIN.

❖ **RATIONALE:**

Reinforced concrete material is widely used in the construction of residential buildings, public buildings and other civil engineering works. Principles of designing reinforced concrete structures are based on the concepts covered in Mechanics of structures and theory of structures. The properties of concrete have applications in designing components of Reinforced cement concrete Building. The basic principles of designing simple structure in Reinforced cement concrete shall help students in carrying out construction and supervision effectively which happen to be a major activity of technicians. The reading and interpretation of structural drawings is the basic skill required to be developed. The use of design aids is another ability to be possessed by technicians. It is therefore essential to provide adequate experience to students of reading structural drawings, following IS code requirements, using design aids in Limit state Method.

❖ **COURSE OUTCOMES:**

The students will be able to–

1. Apply basic principles of design of reinforced concrete sections.
2. Design different members of Structure.
3. Apply ductile detailing to the structural components of the Building.
4. Read and interpret the structural drawing.
5. Use IS-456, IS-875, IS-13920, IS-1893 for design of structures
6. Prepare detailed drawings of the designed structural components.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction to Limit State Method (LSM)	1. State purpose of materials used in RCC. 2. Define Limit State and terms related to it. 3. Enlist various loads acting on structures.	1.1 Definition of RCC, functions of Reinforcement, material properties. 1.2 Definition and types of limit state, partial safety factors for materials and loads, characteristic strength. 1.3 Types of loads, use of IS: 875-1987, characteristic load and design load.	02
2.Analysis and Design of Singly Reinforced Rectangular Sections by LSM	1. Draw stress-strain diagram. 2. Calculate design constants and ultimate moment of resistance. 3. Design balanced and under-reinforced singly reinforced rectangular sections.	2.1 Limit state of collapse (flexure)- assumptions, stress-strain relationship for concrete and steel, design parameters and constants, ultimate moment of resistance. 2.2 Under reinforcement, over reinforcement and balanced sections- meaning and comparison. 2.3 Analysis and design – Numerical problems on determination of design constants, ultimate moment of resistance, ultimate load carrying capacity, design of balanced and under reinforced sections. 2.4 IS specifications regarding spacing, cover, minimum reinforcement, effective span.	06
3. Analysis and design of Doubly Reinforced Rectangular Sections by LSM	1. State conditions for doubly reinforced beam. 2. Calculate ultimate moment of resistance. 3. Design doubly reinforced balanced beams.	3.1 Meaning and conditions for providing doubly reinforced beams. 3.2 Numerical problems on calculation of moment of resistance. 3.3 Numerical problems on design of doubly reinforced balanced section.	06
4. Analysis and design of Flanged Beams by LSM	1. Define terms related to flanged beam. 2. Calculate effective flange width. 3. Determine ultimate moment of resistance. 4. Design flanged beams..	4.1 Meaning and conditions for formation of flanged (T and L) beams, comparison with rectangular beams, effective width of flange. 4.2 Analysis and design of singly reinforced T beam with neutral axis within flange.	06
5. Shear reinforcement and development length by LSM	1. Calculate ultimate shear strength of beam. 2. Design beam for shear. 3. Define and calculate development length.	5.1 Meaning and distribution of shear in RCC beams and slab, IS code specifications, various forms of shear reinforcement in beams, use of bent-up bars. 5.2 Numerical problems on design of beam for shear. 5.3 Meaning of bond and development length in RCC, IS code provisions and calculation of development length in tension and compression.	06

6.Design of Slabs by LSM	1. Decide type of slab from the given data. 2. Design various types of slabs. 3. Draw reinforcement detailing diagram for slabs. 4. Calculate span and design load for dog legged stair case.	6.1. Definition and classification of slabs as one-way and two-way slabs, support conditions, main and distribution steel, I.S. specifications regarding spacing and cover for reinforcement, effective span, minimum reinforcement. 6.2. Design of slabs- Procedure and numerical problems on design of one-way simply supported slab, cantilever slab, two-way simply supported slab with corners free to lift . 6.3 Dog legged staircase- I.S. specification for effective span and load calculation on staircase.	10
7.Design of Column and Footing by LSM	1. State assumptions and define terms related to column. 2. Calculate ultimate load carrying capacity of a given axially loaded column. 3. Design column and draw reinforcement detailing. 4. Design isolated sloped footing and draw reinforcement detailing. 5. Differentiate between various types of footings.	7.1 Limit state of collapse in compression- assumptions, minimum eccentricity, slenderness ration, short and long columns, calculation of ultimate load carrying capacity of axially loaded short rectangular and circular columns. 7.2 Design of axially loaded short rectangular and circular columns . 7.3 Introduction to various types of RCC footings like stepped, sloped, combined footing and piles. 7.4 Design of isolated square sloped footing- Flexural design with checks for one way and two way shear.	08
8. Seismicity and Ductile Detailing	1. Define basic terms in seismicity. 2. Draw ductile detailing diagrams for common RCC members as per IS: 13920-1993.	8.1 Definitions of terms related to earthquake engineering as per IS: 1893(Part1)-2002. 8.2 Assumptions made in earthquake resistant design of structures. 8.3 Ductile Detailing provisions for beam, column, footing and their connections as per IS: 13920-1993.	04
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Sketch/ Draw tables/Graphs/ from IS code provisions and typical reinforcement details of R.C. sections.(5 plates) based on concept of limit state method.	All Units	10
2	Design and Draw details of various elements of R.C.C. residential building (G+1) (Drawing on two A1 size sheets).		
a)	Draw key plan showing positions of columns and beams.	All Units	04
b)	Design one way simply supported , continuous, cantilever and two way slabs.	Design of Slab	14
c)	Design singly reinforced, doubly reinforced and T-beams.	Design of Beams	10
d)	Design columns and columns footings.	Design of Column and Footing	06
e)	Design Dog legged staircase.	Design of staircase	04
f)	Draw a set of structural drawings consisting of two A1 size sheets. Drawing shall normally contain key plan, structural plan showing positions of columns and column footings. Typical c/s and longitudinal section of beams, slabs, column, footings, staircase and bar bending schedule of reinforcement.	All Units	14
Skill Assessment			02
Total Hrs.			64
C. TUTORIALS:			
Sr. No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Design / analysis of singly reinforced, doubly reinforced and flanged beam.	Design of Beams	06
2	Design / analysis of one way, two way and continuous slab.	Design of Slab	06
3	Design / analysis of columns and footings.	Design of Column and Footing	02
4	Design / analysis of staircase.	Design of staircase	02
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to LSM	00(02)	02(00)	00(00)	02 (02)
02	Analysis and Design of SRRS	00(00)	04(04)	06(00)	10(04)
03	Analysis and Design of DRRS	00(00)	04(04)	06 (00)	10(04)
04	Analysis and Design of FB	02(00)	08(04)	00(00)	10(04)
05	Shear Reinforcement and dev. Length	00(00)	06(00)	04(04)	10(04)
06	Design of Slabs	00(02)	06(00)	10 (06)	16(08)
07	Design of Column and Footing	00(00)	00(00)	06(10)	06(10)
08	Seismicity and Ductile Detailing	06(04)	00(00)	00(00)	06(04)
	Total	08(08)	30(12)	30(20)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	1	U	2	4	R	2	5	U	2	6	R	2	1	R	2	5/7
	8	R	2																
02	2	U	4	2	U	4	3	U	4	3	U	4	4	U	4				3/5
03	4	U	4	4	U	4	5	A	4	5	A	4	6	A	4				3/5
04	5	U	4	6	U	4	7	A	4	8	R	4	8	R	4				3/5
05	2	A	6	7	A	6	7	A	6										2/3
06	3	A	6	6	A	6	6	A	6										2/3

T=Unit/Topic Number

L= Level of Question M= Marks

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Plates and Drawing Sheets, Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing RCC details of various components of structure from drawing sheet and sketch book.	20
2	Writing Design procedure/IS specifications	10
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	3	-	-	-	-	-	-	-	-	-	-
4	-	3	3	-	-	-	3	3	3	3	-	-
5	-	3	3	3	-	-	3	3	3	3	-	2
6	-	3	3	3	-	-	3	3	3	3	-	-

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

❖ **REFERENCE and TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Reinforced Concrete (Vol.-I)	H.J.Shah, Charotar Publucation., 9 th Edition,	9789380358475
2.	Illustrated Reinforced Concrete Design	Dr. V.L. Shah, Dr. S.R. Karve, Structure Publication, 5 th Edition, 2015.	81-903717-3-8
3.	Design of RCC Structures	R.R. Gadpal, D.J. Khamkar, R.B. Narhari, Nirali Prakashan, 2 nd Edition, 2016.	978-93-5164-302-9
4.	IS: 456 -2000: Plain and Reinforced Concrete - Code of. Practice	Bureau of Indian Standards, Third Reprint, October 1998.	--
5	IS-875(Part1): Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part1: Dead Loads-Unit Weight of Building Materials (Second Revision).	Bureau of Indian Standards, Published-1987.	--

6	IS-13920-1993, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces-Code of Practice.	Bureau of Indian Standards, Reaffirmed 1998 Edition, 1.2(2002-03).	--
7	IS-1893(part 1)-2002. Criteria for Earthquake Resistant Design of Structures, Part1: General Provisions and Buildings (Fifth Revision)	Bureau of Indian Standards, Published-2002.	--
8	IS-875(Part2): Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part2: Imposed Loads. (Second Revision).	Bureau of Indian Standards, Published-1987.	--

❖ **E-REFERENCES:**

1. www.icjonline.com/ accessed on 6th September,2016
2. www.springer.com/engineering/civil+engineering/journal/40069 accessed on 6th September,2016
3. www.youtube.com/watch?v=vuZcPTp51Zk accessed on 6th September,2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS and TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y.K. Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	A.P.Wagmare	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
3.	H.L.Wahane	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
4.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
6.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM405E
COURSE TITLE	: DESIGN OF STEEL STRUCTURE
PREREQUISITE	: AM302E
TEACHING SCHEME	: TH: 03; TU: 00; PR: 04
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE	: 04 HRs
PR. TEE	: 02 HRs (Internal)
PT :	:01 HR

❖ RATIONALE:

Design of Steel Structures is a technological subject. Steel is commonly used as a construction material for various steel structures such as steel girders, steel bridges, steel trusses, columns, towers, gantry girders, chimney, railway bridges, industrial buildings, water tanks etc. For the design of steel structures, the properties of steel, different steel sections, various grades and strength characteristics of steel are required. The analysis and design of the steel members in the curriculum is to be done as per IS: 800-2007.

The total content of this subject will be useful for developing insight for the design concepts and will help student in effective supervision and quality control on site.

❖ COURSE OUTCOMES:

After completing this course, students will be able to–

1. Analyze and calculate forces in different structural members.
2. Design tension members, compression members, beams, purlins, column bases and steel roof trusses and understand design values for members using IS 800-2007.
3. Interpret different clauses and recommendations of IS800-2007, IS875-1987 and other relevant IS codes.
4. Sketch different Steel sections for tension member, compression member, column and column bases etc.
5. Find design loads on the structures as per IS875-1987.
6. Design and Draw steel roof truss members and connections.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction	1. State various grades of steel and their strength parameters. 2. List various properties of steel sections used for steel structures. 3. Use steel table and IS code for finding different properties of steel sections. 4. Find dead load, imposed load and wind load acting on various steel structures as per IS. 5. Distinguish between working stress method and limit state method. 6. Describe various aspects of limit state method.	1.1 Advantages and disadvantages of steel as construction material. 1.2 Overview of common steel structures: Functions and components of common steel structures like towers, roof trusses, steel water tanks, steel bridges, gantry and crane girders, steel columns, steel chimney, building frames. . 1.3. Types of sections used, Grades of steel and strength Characteristics, use of steel table, IS 808-1989. Typical stress-strain graph for mild steel and salient points in it. 1.4. Types of loads coming on steel structures according to IS 875-1987 part I to III: a) Dead loads b) Live loads c) Wind loads. 1.5. Methods of Design:- Working stress method, Limit state Method. 1.6. Introduction to Limit state Method of design (IS 800-2007): Meaning and types of limit states, loads, design criteria, limit states of strength, limit states of serviceability. Factors of safety and load factors.	03
2. Joints in Steel Structures (Limit State Method)	1. State types of steel joints and their modes of failure. 2. Calculate strength of joint and efficiency of joint for bolted and welded connections. 3. Design bolted and welded steel joints. 4. Draw diagrams of framed connections.	2.1a) Bolted connections: Type of bolts-Black bolts and High strength bolt and their use. Types of joints and failure modes. Specifications for cross-sectional area, pitch, spacing, gauge, end distance, edge distance, bolt holes for bolted connections. 2.2 Design strength of bolt in shear, tension and bearing.. 2.3 Analysis and design of bolted joints for axially loaded single	06

		and double angle members. 2.4 Diagrams of beam – to- beam and beam – to column bolted connections (No numerical problems) b) Welded connections- 1) Introduction and types of welds- butt and fillet. Advantages and disadvantages of welded connections, size of weld, throat thickness. 2) Analysis and design of welded joint (only fillet weld) for single and double angle members subjected to axial load.	
3.Design of Tension Members (Limit State Method)	1. Draw steel sections used for tension members. 2. Analyze and design tension members connected by bolted and welded joints.	3.1 Design of tension members: Types of sections used. Design strength governed by yielding of section, rupture of net cross-section and block shear. 3.2 Analysis and design of axially loaded single angle and double angle tension members with bolted and welded connections.	08
4. Design of Compression Members (Limit State Method)	1. Draw different steel sections used for compression members and column. 2. Define and calculate effective length, radius of gyration, slenderness ratio for struts and column. 3. Analyze and design compression members connected by bolt and weld. 4. Describe lacing and battening. 5. Draw lacing and battening.	4.1 Types of steel sections used for compression members, effective length, radius of gyration, slenderness ratio and its limits, design compressive stress. 4.2 Analysis and design of axially loaded continuous angle struts connection by bolted and welded connections with gusset plate. Limits of width to thickness ratio to prevent local buckling. 4.3 Stanchions and columns- Meaning and diagrams of simple and built-up sections (two angles, two I- sections, two channels placed back to back and toe to toe). No numerical problems. 4.4 Introduction to lacing and battering: Meaning and purpose. Diagrams of single and double lacing and battening systems. (No design problems).	08
5. Beams (Limit State Method)	1. Draw different sections used for beams. 2. Plastic, compact, semi	5. 1 Different steel sections used for beams, simple and built-up sections.	06

	compact and slender sections. 3. Draw loading, shear force and bending moment diagram developed in beam due to uniformly distributed loads. 4. Analyze and design of simple beam sections subjected to uniformly distributed loads.	5.2 Meaning of Plastic (Class -1), Compact (Class-2), Semi -compact(Class -3) and Slender (Class -4) sections. 5.3 Flexural analysis and design of simple beams (only for Class -4 sections) which are laterally supported and subjected to uniformly distributed load. 5.4 Check for shear and deflections: Meaning and purpose. Diagrams of typical cross sections of bolted and welded plate girder. Diagrams showing components of plate girder.	
6. Columns and column bases (Limit State Method)	1. Draw components parts of steel foundations. 2. Draw the sketch of slab base and gusted base foundations. 3. Analysis and design slab base foundation.	6.1 Types of steel foundations.- Slab Base foundations, Gusseted base foundations. 6.2 Design of Slab base foundations. 6.3 Introduction to Gusseted base Foundations: Meaning and purpose. No numerical problems on design of gusseted base foundations.	06
7. Steel Roof Truss (Limit State Method)	1. List types of Steel roof trusses used in industries. 2. Calculate dead load, live load and wind load acting on steel roof truss. 3. Analyze and design component parts of Steel Roof truss. 3. Draw the detailed connections of different members at nodal points, connections at column supports..	7.1 Types of steel Steel Roof trusses for different spans (Simple and Compound Fink, Pratt, Howe, Fan, North Light roof truss) 7.2 Calculation of panel point load for dead load, live load and wind load as per IS 875-1987. 7.3 Graphical method of finding forces in different members of truss due to dead load, live load and wind load. 7.4 Force combination table, design of members of truss. 7.5 Design of angle purlin as per IS recommendations. 7.6 Arrangement of members at support and joints.	11
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare report on commonly used steel structures from models, charts, internet, photographs and actual structures. Report based on type of structure for different types of buildings, types of steel sections used, types of connections and end bearings.	Introduction	02
2	Use of steel table to describe standard rolled steel sections and determine their properties.		02
3	Interpret the salient provisions of IS 800-2007 for analysis and design of tension member and compression member.		04
4	Interpret salient provisions of IS 875-1987 for steel roof truss and industrial shed.		04
5	Perform analysis of loads on roof truss for industrial shed (Draw analysis on Drawing sheet) as per IS 875-1987	Steel roof truss	04
6	Find axial forces in the members of roof truss using graphical method.		08
7	Design members of steel roof truss as per IS 800-2007.	Design of tension member and design of compression member	08
8	Design connections for members and supports of the roof truss as per IS 800-2007.	Joints in steel structures	08
9	Prepare detailed drawing of designed steel roof truss.	Steel roof truss	08
10	Prepare plates on one sixth size drawing sheets on following topics:	Introduction	02
	Different rolled steel sections, their properties and provisions of IS800, IS 875 and other relevant IS codes.		
	Details of connections, different fasteners and connecting materials and their properties etc.	Joints in steel structures	02
	Different types of sections used for tension members, design criteria etc.	Design of tension members	02
	Different types of sections used for compression members, design criteria etc.	Design of compression members	02
	Different column sections, column bases and their design criteria etc.	Columns and column bases	02
11	Prepare a brief report on concept, advantages & disadvantages, application and erecting methods of pre engineered building. Source of information: Industrial visit, expert lectures, internet surfing etc.	Pre Engineered Buildings	06
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	02(02)	00(00)	00(00)	02(02)
02	Joints in steel structures	02(00)	04(00)	00(04)	06(04)
03	Design of tension members	00(02)	04(04)	06(00)	10(06)
04	Design of compression members	02(00)	08(04)	06(00)	16(04)
05	Beams	02(00)	04(04)	06(00)	12(04)
06	Columns and column bases	02(00)	04(00)	06(06)	12(06)
07	Steel roof truss	00(00)	06(06)	06(06)	12(12)
	Total	10(04)	30(18)	30 (16)	70 (38)

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	3	R	2																
02	2	U	4	3	U	4	4	U	4	2	A	4	3	U	4				3/5
03	4	U	4	5	U	4	6	U	4	4	U	4	5	U	4				3/5
04	3	A	6	4	A	6	6	A	6										2/3
05	5	A	6	6	A	6	7	A	6										2/3
06	7	A	6	7	U	6	7	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing sketches of different members, sections and provisions of IS800 and IS875 etc.	10
2	Selection of proper roof truss for the given span, load calculation as per IS875, obtaining design load combination etc.	10
3	Design of purlin	10
4	Calculation of forces in roof truss members and obtaining design forces.	10
5	Design of roof truss members, design of joints and preparing detailed drawing etc.	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	3	-	-	-	3	-	-	-
2	-	3	-	-	3	-	-	-	3	-	-	-
3	-	3	-	-	-	-	-	-	3	-	-	-
4	-	3	-	-	-	-	3	3	3	3	-	-
5	-	3	-	-	-	-	-	3	3	-	-	-
6	-	3	-	-	3	-	3	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Limit state design of steel structures	Dr. V.L.Shah and Mrs. Veena Gore, Structures Publications Pune, Third Edition, 2013	8190371754
2.	Limit design of steel structures	Dr. M.R. Shiyekar, PHI Learning Pvt. Ltd., Second Edition, 2013	9788120347847
3.	Limit design of steel structures	S.K.Duggal, Tata Mc graw Hills Education Pvt.Ltd, 2014	(13): 9789351343493 (10): 9351343499
4.	Limit design of steel structures	S.S.Bhavikatti, I.K. International Publishing house Pvt. Ltd., 2014	13:9789382332947 10:9382332944
4.	IS800-2007: Indian standard general construction in steel - Code of. Practice	Bureau of Indian Standards	--

5	IS-875(Part1): Code of Practice for Design Loads (Other Than Earthquake) For Buildings & Structures. Part1: Dead Loads-Unit Weight of Building Materials (Second Revision).	Bureau of Indian Standards, Published-1987.	--
8	IS-875(Part2): Code of Practice for Design Loads (Other Than Earthquake) For Buildings & Structures. Part2: Imposed Loads. (Second Revision).	Bureau of Indian Standards, Published-1987.	--
9	Steel Tables	S. Ramamrutham, Dhanpat Rai Publishing Co., 2010	9789384378110

❖ **E-REFERENCES:**

<https://youtu.be/DKq9xDVMYmk> , assessed on 31st August, 2016
<https://youtu.be/v-t1tdXZgLQ?list=PLX76DrtWfjnn-VM8Uixbs0Ju8KzNi9KsR>,
 assessed on 31st August, 2016
<https://youtu.be/mtRR-5fzKo8?list=PL7698226C57702A42>, assessed on 31st August, 2016
https://youtu.be/XbeXpRU_qcY, assessed on 31st August, 2016
<https://youtu.be/zinfHVwTHNk>, assessed on 31st August, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
2.	A. P. Waghmare	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	H.L.Wahane	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
4.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	RCOE. Nagpur
6.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	:	PROFESSIONAL COURSES
COURSE CODE	:	CE401E ^S
COURSE TITLE	:	ADVANCED SURVEYING
PREREQUISITE	:	CE301E
TEACHING SCHEME	:	TH: 02; TU: 00; PR: 04 (CLOCK HRS.)
TOTAL CREDITS	:	04 (1 TH/TU CREDIT=1CLOCK HR; 1PR CREDIT=2 CLOCK HRS)
TH.TEE	:	03 HRS
PR.TEE	:	02 HRS (External)
PT	:	01 HR.

❖ RATIONALE:

Modern instruments like Micro optic theodolite, Digital theodolite, EDM, Total Station, GPS, etc. are necessary to minimize the instrumental errors. Theodolite, a versatile instrument, used to measure the horizontal and vertical angles directly. Also calculate the co-ordinates, and plot the map / plan. With the skill of ODM, students will be able to measure the horizontal and vertical distances in tacheometric survey. Total station is modern digital magical survey instrument used for all types of surveys with greater accuracy. Survey skills are developed among the students so that they will be able to select appropriate instruments for the particular type of survey for civil engineering works.

The skill of minimizing personnel errors to achieve maximum accuracy should be developed among the students. .

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Calculate bearings, angles, and coordinates using given data.
2. Apply Bowditch rule and transit rule in theodolite traversing
3. Calculate necessary data for setting out curve.
4. Use transit theodolite as tacheometer to measure RLs and distances.
5. Use modern survey instruments for linear, angular and coordinates measurement.
6. Record the readings using various instruments in field book/soft copy.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Theodolite survey	- Recall the knowledge of Basic Survey. - Define the Tech. Terms. - State the steps for measurement of angles with theodolite. - Describe uses of theodolite. - State the steps to measure deflection angle, Magnetic bearing, and prolongation of straight line using theodolite. - Describe the sources of errors. - Draw traverse. - Calculate the error in traversing. - Apply the check. - Calculate the co - ordinates. - Draw Gale's Traverse Table. - Describe Bowditch and Transit rules. - Draw a map/plan. - Calculate bearings, deflection angles and missing coordinates.	Components of Transit Theodolite and their functions. Technical terms used. Temporary adjustments of Transit Theodolite, Swinging the telescope, Transiting, Changing the face. Measurement of Horizontal angle- method of Repetition, Errors eliminated by method of repetition, Method of Reiteration, Measurement of Deflection angle & Direct angle, Measurement of Vertical angle, Measurement of Magnetic Bearing of a line by Theodolite. Use of Theodolite for Prolonging a Straight line, leveling locating point of intersection of lines (Simple numerical problems on Deflection angle). Sources of Errors in Theodolite Surveying. Permanent adjustment of Transit Theodolite (only relationship of different axes of Theodolite.). Traversing with Theodolite – Method of Included angles, locating details, checks in Closed traverse, Calculation of bearings from angles. Traverse Computation - Latitude, Departure, Consecutive Co-ordinates and Independent Co-ordinates, Error of closure and its adjustment, Balancing the traverse by Bowditch & Transit rule, Gale's Traverse table; (Simple problems).	09

2. Tacheometric survey	1. Define the Tech. Terms. 2. Describe levelling. 3. Describe principle of tacheometry. 4. Calculate the constants. 5. Calculate the RLs and distances. 6. Illustrate survey work by sketch. 7. Distinguish between theodolite and Tacheometer.	2.1 Definition, Principle of Tacheometry, Essential requirements of Tacheometer, Components of tacheometer. 2.2 Use of Theodolite as a Tacheometer with staff held in Vertical and Fixed hair method (No derivation). Equation used in Tacheometer, provisions of lenses, Determination of Tacheometric constants. 2.3 Simple numerical problems, finding Horizontal and Vertical distances and Reduced levels of points.	04
3. Computation of area and volumes	1. Define the Tech. Terms. 2. Differentiate between Polar and Digital planimeter. 3. Describe zero circle. 4. Calculate the area of a map. 5. Calculate the volume of earthwork. 6. Describe Prismoidal and Trapezoidal formula.	3.1 Planimeter – Polar and digital, Component parts, construction and use, area of zero circle, Computation of areas using both types of planimeter and comparing. 3.2 Prismoidal Formula, Trapezoidal formula. 3.3 Computation of volume from contour maps by Trapezoidal and Prismoidal formulae, Calculation of earthwork quantity from Profile levelling sheet of IIIrd Sem.	04
4. Curves	1. Define the Tech. Terms. 2. Illustrate the curves with sketch. 3. Draw the curves using given data. 4. Calculate the necessary data to trace the curve by offset from long chord method and Rankine's method. 5. Name the components of curve.	4.1 Types of Horizontal and Vertical curves used in Road and Rail alignment, terms used. Commonly used Radii and Degree of curves for road and railway alignments. 4.2 Notation for Circular curves and corresponding calculations. Calculation of data required to set a curve. 4.3 Setting out Curves - Methods – Offset from Long Chord method and Tangential method (Rankine's method). 4.4 Calculate the ordinates of curve by long chord method. Calculate data to trace the curve by Rankine's method.	06

5. Advanced survey equipments	1. Define the Tech. Terms. 2. State advantages of modern equipment. 3. Describe the principles of EDM. 4. Describe working of Micro optic theodolite, Electronic theodolite, EDM, Total station, GPS. 5. Describe the process of traversing and profile survey by Total Station. 6. Analyze the survey data. 7. Describe the process to create a digital map.	5.1 Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite. Features of Electronic Theodolite. 5.2 Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M. 5.3 Construction and Use of Total Station. Measurements with Total Station. Hor angles, vertical height measurements, Traversing, Profile Survey, 5.4 Contouring with Total Station. 5.5 Construction and Use of Digital Level. 5.6 Construction and Use of G.P.S. 5.7 Introduction of GIS.	06
6. Aerial survey and remote sensing	1. Define the Tech. Terms. 2. Identify topographical map. 3. Describe aerial survey. 4. Describe Remote Sensing. 5. State application of remote sensing. 6. Distinguish between Active and Passive remote sensing.	6.1 Aerial Survey Introductions, definition, Aerial photograph. 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy, Remote sensing system- Passive system, Active system. Applications – Minerals, Land use / Land cover, Natural Hazards and Environmental engineering system.	03
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the components of Theodolite and their functions, reading the Vernier and temporary adjustments of Theodolite.	Theodolite survey	06
2	Measure Horizontal angle by Transit Theodolite.		04
3	Measure Horizontal angle by method of Repetition.		04
4	Measure Vertical angles by Theodolite.		02
5	Measure Magnetic bearing of a line, Prolongation of straight line, Measure Deflection angles using Theodolite.		04
6	Mini Project- 1: (A whole day project.) Compute and plot the Gale's Traverse table using Theodolite for minimum 5-6 sided traverse including building inside for small area. Use A1 size imperial sheet for plotting and measurement of area from independent coordinates.		08
7	Use of Tacheometer, finding the constant of Tacheometer.	Tacheometric survey	04
8	Find reduced levels and horizontal distances using Theodolite as a tacheometer.		02
9	Use simple planimeter to find the area of irregular figure.	Computation of area and volumes	02
10	Use digital planimeter to measure the area enclosed by contours. Use drawing plotted in Basic Surveying course for this practical.		02
11	Use One Second Micro Optic Theodolite for measurement of Horizontal and Vertical angles	Advance survey equipments	04
12	Use Electronic Theodolite for measurement of Horizontal and Vertical angles.		04
13	Project – 2: (A whole day project.) Use Total Station for finding Horizontal and Vertical angles, Profile levelling, Contouring, and Traversing.		08
14	Use of Global Positioning System to identify the location of various stations and structures.		04
15	Set out Simple circular curve by Rankine's method of Deflection angles and Long Chord method for a given problem.	Curves	04
Skill Assessment			02
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Theodolite Survey	02(02)	08(04)	06(04)	16(10)
02	Tacheometric Survey	04(02)	04(00)	04(04)	12(06)
03	Computation of Area and Volumes	02(00)	04(06)	06(00)	12(06)
04	Curves	02(00)	04(00)	06(06)	12(06)
05	Advanced Survey Equipments	02(04)	04(04)	06(00)	12(08)
06	Aerial Survey and Remote Sensing	02(00)	04(00)	00(04)	06(04)
	Total	14(08)	28(14)	28 (18)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	2	R	2																
02	2	R	4	1	U	4	1	U	4	5	R	4	1	U	4				3/5
03	2	U	4	3	U	4	4	U	4	5	U	4	1	A	4				3/5
04	5	U	4	6	U	4	2	A	4	2	A	4	6	A	4				3/5
05	1	A	6	3	A	6	3	U	6										2/3
06	4	A	6	5	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Field Book	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Figure/ Index sketch	10
2	Observations,	15
3	Calculations and Result	15
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	3	-	-	-	-	-	-	-	-	-	-
2	3	3	-	3	2	-	2	3	-	3	-	-
3	3	3	-	3	-	-	-	3	-	3	-	-
4	3	3	3	3	2	-	2	3	3	3	3	-
5	3	3	3	3	-	-	-	3	3	3	3	-
6	3	3	3	3	-	-	-	3	3	3	3	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	A Text book of Advance Surveying.	R. Agor. Khana Publishers, 2002	8174090533
2.	Surveying Vol 2	K R Arora, Standard Book House Publishers, 2010	8189401246
3.	Surveying Vol. 2	Dr. B. C. Punmia, Luxmi Publisher, Sixteenth Edition, 2016	8170088836
4.	Advance Surveying	Satheesh Gopi, Pearson Publications, 2007	8131700674
5.	Advanced Engg Surveying: Problems and Solutions	Shepherd F A. Better World Books Ltd (UK), 1982	9780713134162

❖ **E-REFERENCES:**

<http://flh.fhwa.dot.gov.>survey>documents> , assessed on 14th March 2016

<http://www.jntubook.com> , assessed on 14th March 2016

<https://www.cbeps-cceag.ca>, assessed on 14th March 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Vernier Theodolite (Vernier Transit theodolite 127mm/178mm, export quality fitted with /without Optical Plummets with suitable attachment and accessories in wooden/metal box with telescopic aluminum/wooden stand & 20/10 Sec Accuracy).
2. Micro-optic Theodolite (1" Least Count 30 X magnification, Hor standard deviation $\pm 2''$, Ver standard deviation $\pm 6''$, Optical Plummet, Reflector, including accessories).
3. Polar Planimeter (Planimeter with sliding base pattern having a mechanism consisting of circular disc roller, vernier, along with tracing and fixing arms with the values of multiplying constant and additive constants).
4. Digital Planimeter (Planimeter with sliding base pattern having a mechanism consisting of circular disc roller, LCD screen, Keyboard, Battery, Charger)
5. Electronic Theodolite with EDM (30X, 3.0" resolving power, min focus 1m, laser, reflector, laser/optical plummet, 1" accuracy, Two sided LCD/LED screen, battery, Internal memory with accessories)
6. Total Station (30X, EDM 45mm, 3.0" resolving power, min focus 1m, laser, reflector, laser/optical plummet, 1" accuracy, Two sided LCD/LED screen, battery, Internal memory with accessories).
7. GPS (18X 5Hz or 18x LVC or any other relevant instrument used for surveying).

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	R.N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3	M. R. Shelote	Consultant	M.R. Associates, Nagpur
4	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
5	A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE402E ^S
COURSE TITLE	: BUILDING CONSTRUCTION
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1TH/TU CREDIT=1 CLOCK HR, 1 PR CREDIT=2 CLOCK HR)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (External)
PT	: 01 HR

❖ RATIONALE:

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

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the basic concepts of various construction activities for buildings.
2. Identify different elements of building and their functions.
3. Choose different types of foundations.
4. Set out center line, level and plumb of various construction activities.
5. Check thickness and verticality of plaster.
6. Sketch the building elements.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Building Elements	1. Define various component of building. 2. Identify component of building. 3. State different methods of soil exploration. 4. Distinguish between load bearing structure and frame structure. 5. Identify load bearing structure, frame structure and composite structure. 6. State design principles of earth quake resistance structure.	1.1 Inspection of site and site exploration. 1.2 Component of building: foundation, plinth, DPC, Wall, Sill, Lintel, Doors, Windows, Floor, Roof, Parapet, Slab, Columns, beams and their functions. 1.3 Concept of Load bearing Structure, Frame Structure and composite structure. 1.4 Advantages of framed structures over load bearing structure. 1.5 General design principle of earthquake resistance structures: while planning and during construction.	04
2. Foundation	1. Define site clearance. 2. Describe job layout. 3. Describe centre line method for load bearing structure and frame structure. 4. Define timbering and strutting. 5. Describe timbering and strutting. 6. List tools and plants used in excavation. 7. Define foundation, 8. Identify various types of foundation. 9. Describe various types of foundation. 10. Describe the characteristics of black cotton soil. 11. Describe coffer dam.	2.1 Site clearance, preparing job layout, Layout for load bearing structure and frame structure by centre line method. Precautions while making layout on ground. 2.2 Excavation for foundation, Timbering and strutting for foundation trench, Tools and plants for excavation. 2.3 Foundation: purpose, types, of foundation. Foundation on sandy and clayey soil. 2.4 Shallow foundation: Purpose, Wall footing, column footing, combine footing, strap footing, raft foundation. 2.5 Deep foundation: purpose, Pile, different types of pile, concrete piles, pre cast, cast in situ, under reamed piles. 2.6 Well foundation: purpose 2.7 Foundation on black cotton soil, characteristics of black cotton soil. 2.8 Cofferdam: Purpose, types, uses, sketch.	15

3 Brick masonry and Stone masonry	1. Define technical terms related to brick masonry and stone masonry 2. Describe various types of stone masonry, Brick bond. 3. Sketch various types of stone masonry and brick bonds. 4. Apply the knowledge of stone and brick masonry in the field. 5. Compare Stone and brick masonry. 6. Describe line level and plumb.	3.1 Stone Masonry - Construction of stone masonry in various parts of structure, terms used in stone masonry facing, Backing, Hearting, Through stone, Corner stone, cornice etc. 3.2 Classification of stone masonry, Rubble masonry - uncoursed rubble masonry, coursed rubble masonry, Ashlar masonry – Ashlar fine, rough tooled, rock faced, chamfered faced 3.3 Important points to be observed in the construction of stone masonry. 3.4 Brick Masonry - Definition of different terms used in brick masonry, General principle to be observed in the construction of good brick masonry 3.5 Bonds in brick work, Different types of bond, Header bond, stretcher bond, English bond, single Flemish bond, Double Flemish bond. 3.6 Laying of brick work - soaking of brick in water, line level plumb	10
4 Openings, Stairs and other Tech. Terms	1. Define Technical terms related to doors, windows, arches, stairs. 2. Sketch various types of doors, windows, stairs, and lintels. 3. List different sizes of doors, windows and stairs, sills, lintel and fixtures and fastening in doors and windows. 4. Choose different types of doors, windows and stairs in different situations. 5. List requirement of good stairs. 6. Discuss ISI standard for stair case. 7. Discuss different	6.1 Doors - Purpose, location, function, different parts of door. 6.2 Different materials used for door frames-timber, metal and concrete frame, aluminium frames, Sizes as per I.S.I for residential and public building. 6.3 Types of doors- paneled, flush, partially and fully glazed doors, PVC door. 6.4 Purpose of collapsible and rolling shutter door 6.5 Windows - Different materials used for window frames-timber, metal and concrete frame, aluminum frames, Sizes of windows as	15

	materials used for different elements.	per I.S.I. 6.6 Types of windows- fully paneled, glazed, louvered, steel window, aluminum sliding window, steel window, ventilators.. 4.7 Fixtures and fastening for doors and windows. 4.8 Sills- purpose, Types- concrete, kadappa, marble, granite. 4.9 Lintels- purpose, bearing, thickness, Types- wooden, stone, brick, R.C.C. 4.10 Arches – type and function. 4.11 Stairs – Location, function Technical terms, Rule for design, I.S.I standards for tread, rise and width for residential building. Requirement of good stairs. 4.12Types – dog legged, quarter turn, half turn bifurcated, open well, spiral, circular, geometric 4.13Material of construction – R.C.C., precast, metal.	
5 Floors and Roofs	1. Define Technical term related to floors and roof. 2. List different types of floors, finishes, roof trusses and roof covering. 3. Sketch different types of roofs and trusses. 4. Describe different types of floor finishes and roofs.	5.1. Ground floor: purpose and requirement of floor, plinth beam, its purpose and construction, Upper floors: purpose, material of construction, Mezzanine floor: Use, location and requirement. 5.2. Floor finishes and Tiles- Shahabad, kotah, marble, granite, kadappa, glaze/unglazed ceramic, vitrified, plain cement, mosaic tiles, checker tiles. 5.3 Fixing and polishing of different types of tiles. 5.4 Process for fixing different types of tiles. Process for fixing different types of finishes to walls (skirting and dado). 5.5 Roofs: Necessity of pitch and flat roofs.	10

		5.6 Steel trusses types, requirement, and advantages disadvantages. 5.7 Roof coverings- A.C. sheet, G.I. sheets. R.C.C, slab roof, pre cast slab.	
6 Finishing and Miscellaneous Works	1. Define technical terms related to finishing and miscellaneous works. 2. List different types of plastering, pointing, painting, scaffolding, and shoring. 3. Sketch different types of types of scaffolding, shoring, pointing and under pinning. 4. Describe pointing and painting. 5. Describe earthquake protection in building.	6.1 Plastering, Purpose, mortar and its proportion. 6.2 External finishes such as sand faced, rough cast, pebble dash. 6.3 Internal finishes such as undercoats, neeru finish and pop. 6.4 Pointing, Purpose, types of pointing. 6.5 Painting, Purpose, process involve such as surface preparation, applying coating, type. 6.6 Scaffolding, Component and types, process of erection. 6.7 Shoring Purpose, type. 6.8. Under pinning, purpose. 6.9 Form works-purpose, formwork for concrete works. 6.10. Earthquake protection ,types of construction- frame construction, Box type construction, Special construction features, IS code of Earthquake Engineering.	10
Total Hrs			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Set out central line plan of small residential structure (load bearing)	Foundation	04
02	Set out central line plan of small residential structure (Frame structure)		04
03	Establish levels for flooring using a transparent plastic tube and water.	Floors and Roofs	02
04	Develop English and Flemish bond in alternate courses for one brick thick wall corner and one and half brick wall corner.	Brick and Stone masonry	04
05	Check thickness and verticality of plaster work using plumb bob and straight edge.	Finishing and miscellaneous work	02
06	Prepare a report on observing procedure and methods of plastering.		04
07	Prepare a report by Observing the procedure and methods of flooring of any one type.		02
08	Draw Labeled Sketches for Section of column footing on A4 Size Sheet.	Foundation	02
09	Draw Plan, elevation and section of flush door on A4 Size Sheet.	Openings, Stairs and Other Tech. Terms.	02
10	Draw Plan and section of R.C.C. dog-legged stair on A4 Size Sheets.		02
11	Draw sectional elevation of R.C.C. beam, columns and slab showing reinforcement on A4 Size Sheet.	Finishing and miscellaneous work	02
Skill Assessment			02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Building elements	00(00)	04(02)	00(00)	04(02)
02	Foundation	02(06)	08(04)	06(00)	16(10)
03	Brick and stone masonry	06(00)	06(00)	00(06)	12(06)
04	Openings, stairs and other tech. terms.	08(04)	04(04)	04(00)	16(08)
05	Floors and roofs	02(04)	04(04)	06(00)	12(08)
06	Finishing and miscellaneous work.	02(00)	04(00)	04(06)	10(06)
	Total	20(14)	30(14)	20(12)	70 (40)

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	2	R	2	5/7
	1	U	2																
02	3	R	4	1	U	4	2	U	4	2	R	4	4	R	4				3/5
03	2	U	4	4	U	4	5	U	4	5	R	4	2	U	4				3/5
04	6	U	4	4	A	4	6	A	4	4	U	4	5	U	4				3/5
05	4	R	6	3	U	6	3	A	6										2/3
06	2	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correct drawing	10
2	Labeling and Dimensioning	10
3	Neatness	10
4	Viva -Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	3	-	3	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	3	-	-	3	-	3	-	-	-	-	-
4	-	3	2	-	3	-	-	2	-	2	2	-
5	-	3	2	-	-	-	-	2	-	2	2	-
6	-	3	2	-	-	-	3	2	1	2	2	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building construction	Sushil kumar, Standard Publication, 2010	10: 8180141683 13:9788180141683
2.	A textbook of building construction	S.P.Arora and S.P.Bindra Dhanpat Publication, 2013	9788189928803
3.	Building construction	B.C.Punmia, Ashok kumar Jain Arun kumar Jain , Laxmi Publication, 5 th edition, April 1993	81-7008-053-3
4.	Building construction	S.K.Sharma, S Chand & Company pvt.Ltd. ,2014	13:9788121904797
5.	Building construction	S.C.Rangwala,Charotar Publication, 33 rd Edition, 2016	13:978 93 85039 0 41
6	Building construction	Dr. Janardanzha, Khanna Publication, 5 th Edition, 2007	8174091106
7	Civil Engineering Drawing	M. Chakraborty, M Chakraborty - Kolkata	13:M158000000002

8	SP 7 (2005): National Building Code of India 2005	Bureau of Indian Standards	81-7061-026-5
9	IS 4326: 1993-code of practice for earthquake resistant design and construction of building.	Bureau of Indian Standards	-
10	IS 1893:1984- Criteria for earthquake resistant design of structures.	Bureau of Indian Standards	-
11	IS13920:1993- Ductile detailing of reinforced concrete structures subjected to seismic forces-code of practice.	Bureau of Indian Standards	-
12	IS13935:1993-Guidelines for repair and seismic strengthening of buildings.	Bureau of Indian Standards	-
13	IS 13828: 1993- Improving earthquake resistance of low strength masonry buildings –Guidelines.	Bureau of Indian Standards	-
14	Handbook SP 22 (S&T): 1982- Explanatory handbook on codes for earthquake engineering. (IS1893: 1975 and IS 4326:1976)	Bureau of Indian Standards	-
15	IS 3067-1988-Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings.	Bureau of Indian Standards	-

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- www.unisdr.org/.../10329_GoodBuildi, accessed on 22th August,2016
- www.ce.udel.edu/.../building_notes102, accessed on 22th August,2016
- <https://law.resource.org/pub/in/bis/S03/is.sp.62.1997.pdf>, accessed on 22th August,2016
- samples.sainsburysebooks.co.uk/97813, accessed on 22th August,2016
- <https://www.youtube.com/watch?v>, accessed on 22th August,2016
- <https://www.youtube.com/watch?v>, accessed on 22th August,2016
- <https://www.youtube.com/watch?v>, accessed on 22th August,2016
- <https://www.youtube.com/watch?v>, accessed on 22th August,2016
- <https://www.youtube.com/watch?v>, accessed on 22th August,2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- Total Station (30X, EDM 45mm, 3.0” resolving power, min focus 1m, lazer, reflector, lazer/optical plummet, 1” accuracy, Two sided LCD/LED screen, battery, Internal memory with accessories)

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr.R.N.Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. V.P.Chindhalore	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Dr. S.J.Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr.M.R.Shelote	Consultant	M.R.Associates, Nagpur.
5.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur.
6.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE403E^s
COURSE TITLE	: HYDRAULICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs.
PR. TEE	: 02 HRs. (External)
PT	: 01HR.

❖ **RATIONALE** :

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

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Determine Hydrostatic pressure and Centre of pressure under different conditions
2. Design pipe and channel systems for a given condition.
3. Identify suitable type of flow measuring devices for pipe and channel.
4. Measure pressure , head ,discharge and losses in pipe and channel flow.
5. Determine hydraulic coefficients of flow measuring devices.
6. Identify various components of pumps and its suitability.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Physical properties of fluids	1. State importance of hydraulics 2. Define fluid 3. Define specific weight, mass density, specific gravity, viscosity, surface tension, Capillarity and state S.I. units 4. Calculate specific weight, mass density, specific Gravity, bulk modulus of elasticity of liquid	1.1 Importance of learning hydraulics with special reference to Irrigation engineering and Environmental engineering and other courses 1.2 Definition of fluid Definition of fluid mechanics and hydraulics Difference in behavior of liquid with solids 1.3 Definition and S.I. units – specific weight, mass density, specific gravity, viscosity, surface tension, Capillary rise and depression, bulk modulus of elasticity, compressibility, ideal and real fluids Newton's law of viscosity Numerical on specific weight, mass density, specific Gravity, bulk modulus of elasticity	06
2. Hydrostatic pressure and pressure measurements in pipes	1. Define pressure and pressure head 2. State Pascal's law. 3. Describe devices used for Measurement of pressure 4. Define Total pressure and centre of pressure 5. Write the expression for total pressure and depth of centre of pressure on surface immersed in static liquid 6. Calculate deflection of manometric liquid and pressure.	2.1 Pressure, free liquid surface, pressure head. Pascal's law, Variation of pressure in horizontal and vertical direction. Pressure at a point in static liquid. Total pressure on side and bottom of water tank, side and bottom of tank containing two different liquids, Pressure on vertical surface in contact with liquid on either side, Numerical on all cases. Pressure diagram – Definition and its use 2.2 Measurement of pressure in pipes- Concept of pressure, pressure head and its unit 2.3 Manometers- Types- Simple manometers, Piezometers, U-tube simple Manometers, U-tube differential Manometers, inverted U-tube Manometers, Numerical on manometer	12

		Mechanical Gauges - Bourdon's tube pressure gauge, Atmospheric pressure, Gauge pressure, Absolute pressure and relation between them Numericals on calculation of gauge pressures/absolute pressures	
3. Fundamentals of fluid flow	1. State types of flow and give example of each 2. Define discharge and state its unit 3. Describe Continuity equations for liquids 4. Describe head and its type. 5. State Bernoulli's theorem & equation 6. State Modified Bernoulli's theorem 7. Calculate total energy, discharge of liquid	3.1 Types of flow- steady and unsteady, uniform and non-uniform, Laminar and turbulent, compressible and incompressible, various combination of flow through pipe and channel with examples 3.2 Discharge-definition and its unit 3.3 Continuity equations for liquids Numerical 3.4 Datum head, pressure head, velocity head, total head Bernoulli's theorem-statement, assumptions Bernoulli's modified equation Numerical on Bernoulli's theorem	10
4. Flow through pipes	1. Define loss of head due to friction 2. Describe Law of fluid friction for laminar flow and turbulent flow 3. State Darcy- Weisbach equation 4. Describe Reynolds number and state its significance 5. Enlist Minor head losses in pipe 6. Describe Hydraulic gradient line and Total energy line 7. Write equation of discharge of Flow through pipes in series, parallel, compound and equivalent pipe 8. Define Water hammer, its Causes, effects and remedial measures 9. Calculate minor losses, discharge in pipes in series and parallel and compound	4.1 Loss of head due to friction Darcy- Weisbach equation Common range of friction factor for different types of pipe material. Reynolds number and its significance, Relative roughness-Definition, Determination of coefficient from Moody's diagram 4.2 Minor loss of head in flow through pipe- Loss of head due to sudden expansion, gradual expansion, sudden contraction, gradual contraction, at entrance, exit and head loss in various pipe fittings such as bends, valves, elbows etc 4.3 Hydraulic gradient line and total energy line Numerical on minor losses, friction factor 4.4 Flow through pipes in series	12

	pipe, friction factor	and parallel ,compound pipe, equivalent pipe- Dupit's equation Numerical 4.5 Water hammer –Concept, Causes, effects and remedial measures 4.6 Use of Nomograms for design of pipe	
5. Flow through open channels	1. Define hydraulic mean depth, wetted perimeter and area 2. Describe types of flow in channel 3. Compare flow through pipe and channel 4. State condition for most economical rectangular and trapezoidal channel sections 5. Define hydraulic jump and state its uses and locations 6. Calculate discharge through rectangular and trapezoidal channel 7. Calculate dimensions of most economical rectangular and trapezoidal channel sections	5.1 Different shapes of artificial channels Definition- wetted perimeter, wetted area, hydraulic mean depth Types of flow in open channel- steady and unsteady, uniform and non-uniform Comparison of flow through pipe and open channel 5.2 Determination of discharge through an open channel- Chezy's equation and Manning's equation Numerical on discharge through rectangular and trapezoidal channel Definition of Most economical channel section- , Conditions for most economical rectangular and trapezoidal channel sections and Numericals 5.3 Hydraulic jump- Definition, uses, locations where hydraulic jump occurs	10
6. Flow measurement	1. Enlist discharge measuring devices for pipes 2. Describe venturimeter with neat sketch 3. Enlist discharge measuring devices in open channel 4. State types of weir 5. Describe venturi flumes and standing wave flume 6. Enlist velocity measuring devices 7. Define venacontracta 8. Classify orifice	6.1 Discharge measuring devices for pipes-. Venturimeter- Principle, component parts, determination of discharge through venturimeter, coefficient of venturimeter, numerical 6.2 Discharge measuring devices used in open channels – Notches – types of notches- rectangular, triangular, trapezoidal, expression for discharge through rectangular	11

	9. Derive relation between C_c, C_v, C_d 10. Calculate discharge over weir, notches and orifice 11. Calculate hydraulic coefficients of orifice	and triangular notch, numerical Francis formula Weir - Types, Expression for discharge over rectangular sharp crested weir Cippoletti weir- Definition Flumes – venture flumes, standing wave flume, expression for discharge 6.3 Velocity measuring devices- Floats – Types Simple Pitot tube –expression for velocity Orifice- Definition, vena contracta, use of orifice Classification of Orifice according to size, shape and discharge condition Hydraulic Coefficients- Coefficient of contraction(C_c), coefficient of velocity(C_v), coefficient of discharge(C_d) Relation between them Determination of C_c, C_v, C_d of small sharp edge circular orifice discharging free, Numerical	
7.Pumps	1. Define pump and state types 2. Identify component parts of centrifugal pumps 3. Find power required for pumps 4. Describe submersible pump and principle of working 5. Describe Single and Double acting Reciprocating Pump and principle of working 6. Compare centrifugal pump and reciprocating Pump	7.1 Pump- Definition, types 7.2 Centrifugal pumps – principle of working, component parts, priming of pump, Computation of power required for pumps and Numericals. 7.3 Submersible pump-Component parts, principle of working Single and Double acting Reciprocating Pump- Component parts, principle of working	03
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Measure pressure by Piezometers and pressure gauges. Measure pressure difference by using U-tube differential Manometer.	Hydrostatic pressure and pressure measurements in pipes	03
2.	Calculate total head at different cross sections of a given pipe to verify Bernoulli's Theorem.	Fundamentals of fluid flow	04
3.	Determine friction factors for a given pipes of different diameters using Darcy Weisbach equation.		04
4.	Identify type of flow through a pipe using Reynolds experiment.		03
5	Determine minor losses in pipeline for (any one) 1. Sudden contraction. 2. Sudden expansion		03
6.	Determine hydraulic coefficient of a sharp edged circular orifice.	Flow measurement	03
7.	Determine coefficient of discharge for a given Venturimeter.		03
8.	Determine coefficient of discharge for a given rectangular/triangular notch.		03
9.	Identify parts of centrifugal pumps. Collect pamphlet of any make centrifugal/submersible pump	Pumps	04
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction and physical properties of fluid	00(02)	04(00)	02(00)	06(02)
02	Hydrostatic pressure and pressure measurement in pipes	02(04)	08(04)	06(00)	16(08)
03	Fundamentals of fluid flow	02(00)	04(04)	06(00)	12(04)
04	Flow through pipes	04(02)	04(00)	06(06)	14(08)
05	Flow through open channel	02(00)	04(04)	06(00)	12(04)
06	Flow measurement	02(00)	00(04)	04(06)	06(10)
07	Pumps	00(00)	04(04)	00(00)	04(04)
	Total	12(08)	28(20)	30(12)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	A	2	2	R	2	3	R	2	5	R	2	6	R	2	4	R	2	5/7
	1	R	2																
02	4	R	4	1	U	4	2	U	4	2	U	4	3	U	4				3/5
03	2	U	4	3	U	4	4	U	4	5	U	4	6	U	4				3/5
04	5	U	4	6	A	4	7	U	4	7	U	4	2	R	4				3/5
05	2	A	6	3	A	6	4	A	6										2/3
06	4	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M = Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Observations,	15
2	Calculations and Result	15
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	3	3	-
3	-	3	-	-	-	-	-	-	-	3	-	-
4	-	3	2	-	-	-	-	2	2	3	3	-
5	-	3	2	-	-	-	-	2	2	-	3	-
6	-	3	2	-	-	-	-	2	2	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Hydraulics and Fluid Mechanics Including Hydraulics Machines	P. N.Modi & S. M. Seth, Standard Book House, 18 th Edition, 2011	8189401269
2	Fluid Mechanics and hydraulics	Jagdish Lal, Metropolitan book co. pvt. Ltd. , 9 th Edition 2008	8120004221
3	Fluid Mechanics and Hydraulic Machines	R. K.Bansal, Laxmi publication New Delhi, , 9 th Edition 2015	8131806618
4	Fluid Mechanics & Hydraulic Machines	R.K. Rajput, S . Chand Publisher, , 5 th Edition 2014	8121916666
5	Hydraulics Fluid Mechanics and fluid machines	S. Ramamrutham, Dhanpat Rai and Sons, Delhi, 1 st Edition 2006	8187433841
6	Hydraulics Fluid Mechanics and fluid machines	R. S. Khurmi S . Chand Publisher, 19 th Edition 2007	8121901626

❖ **E-REFERENCES:**

- www.howstuffworks.com
- <https://books.askvenkat.com/hydraulics-and-fluid-m..> accessed on 1st Sept 2016
- <https://books.google.com/.../Fluid Mechanics> accessed on 1st Sept 2016
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❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. N. H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. V.P. Chindhalore	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. M. R. Shelote	Consultant	M R Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
6.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFFESIONAL COURSES
COURSE CODE	: CE404E ^{\$}
COURSE TITLE	: ESTIMATING AND COSTING
PREREQUISITE	: CE302E
TEACHING SCHEME	: TH: 03; TU:00;PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 05(1TH/TU CREDIT=1 CLOCK HR, 1 PR CREDIT=2CLOCK HRS)
TH.TEE	: 04HRS.
PR. TEE	: 02 HRS. (External)
PT	: 01½ HRS.

❖ RATIONALE:

A civil engineer mainly deals with construction of civil engineering structure. This course enables the students to prepare the estimate for all type civil engineering construction works. In absence of market rates they can prepare their own rate analysis and thereby prepare the estimate. Estimating and costing skills are very important for a Civil Engineer. This further will lead the students as professionals / entrepreneur in Civil Engineer.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify various methods of estimation.
2. Apply principle of estimating for preparing estimates.
3. Identify factor affecting rate analysis and specification.
4. Prepare approximate and detailed estimates.
5. Compute rate of various items of Civil Engineering Works.
6. Draft specifications for various items of Civil Engineering Works.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Introduction	1. Define (a) Estimating (b) Costing 2. Describe need of Estimating and costing 3. Describe various types of estimates	1.1 Definition (a) Estimating (b) Costing 1.2 Purpose /need of Estimating and costing. 1.3 Types of estimates (a) Approximate Estimate (b) Detailed Estimates (c) Revised Estimate (d) Supplementary Estimate (e) Annual maintenance and repair estimate.	04
2. Principles of Estimating.	1. Enlist different civil engineering items of works along standard mode of measurements. 2. Describe rules for deduction for various items of work as per I.S.1200 / P.W.D. hand books. 3. Describe various Provision and purpose of, Contingencies charges, Work charge Establishment charges, Quality control charges, Centages charges, Electrification Charges, Water supply and sanitary charges. 4. Define various Terms used in estimates.	2.1 Units and standard modes of measurements for different civil engineering items of works as per I.S. 1200/as per P.W.D. Handbook. 2.2 Different civil engineering items of works different / various items of works and rules for deduction as per I.S.1200 / P.W.D. hand books. 2.3 Provision and purpose of (a) Contingencies charges (b) Work charge establishment charges (c) Quality control charges (d) Centages charges (e) Electrification charges (f) Water supply and sanitary charges. 2.4 Terms used in estimates (a) Prime cost (b) Provisional sum (c) Provisional quantities (d) Spot items (e) Extra items (f) Lum sum.	06

3. Approximate estimate.	1. List purpose of preparing approximate estimate 2. Identify method of estimate to adopted for different types of civil engineering structure 3. Prepare approximate estimate for civil engineering structures,	3.1 Purpose of preparing approximate estimate. 3.2 Method / Types / Classification of approximate estimate for buildings with application and numerical(a) Service unit method (b) Plinth area method (c) Cubical content 3.3 Preparation of approximate estimate for following civil engineering structures - (a) Irrigation Project. (b) Water supply & Sanitary Project. (c) Road Project. (d) Railway Project (e) Bridge Project.	06
4. Detailed Estimates	1. List of items of Civil Engineering works. 2. Describe steps in preparing detailed estimate. 3. Sketch/draw the format generally adopted in estimating. 4. Describe Methods / Procedure for taking out quantities of various items of works 5. Compute quantities for earth work, and reinforcement	4.1 Check list of items of small residential building (Load bearing). 4.2 Steps in preparing detailed estimate – (a) Measuring the dimension. (b) Squaring the dimension. (c) Abstracting or working up. (d) Billing. 4.3 Contents of measurement sheets / Abstract sheet And General Abstract sheet, Face sheet 4.4 Methods / Procedure for taking out quantities of various items of works by (a) (i) Long wall & short wall methods. (ii) Centre line method with examples for load bearing structure. (b) For Framed structure with examples. 4.5 Methods of earthwork estimate for road and canals with examples. 4.6 Calculation of M.S. (Mild Steel) bars reinforcement with bar bending schedule in R.C.C. (Reinforced Cement Concrete) members like footings, beams, columns and slabs	18

5. Rate Analysis.	1. Define various Technical terms used in rate analysis 2. Identify factors affecting rate analysis. 3. Identify factors affecting task works and schedule of rates 4. Computes the quantities of materials required for different items of civil engineering works. 5. Prepare rate analysis for civil engineering works	5.1 Definition / meaning of rate analysis. 5.2 Purpose and importance of rate analysis. 5.3 Factors affecting rate analysis (Major & minor). 5.4 Meaning of lead and lift. 5.5 Task work, factors affecting task works and schedule of rates. 5.6 Categories of labour with their prevailing wages. 5.7 Transportation of materials and capacities of trucks and bullock carts. 5.8 Working the quantities of materials required for different items of civil engineering works. 5.9 Preparing rate analysis for a few common items of civil engineering works such as - (a) Excavation in any type of soil (b) IInd class B.B. (Burnt Brick) masonry in C.M. (Cement Mortar) 1:6 (c) 12 mm. thick cement Plaster in C.M. – 1:5 (d) R.C.C. (1:2:4) mix excluding reinforcement.	09
6. Specification.	1. Define and describe specification. 2. Enlist points to be observed in drafting the specification of an items 3. Draft specification of items of civil engineering works	6.1 Definition / meaning of specification. 6.2 (a) Necessity (b) Importance (c) Purpose of specification. 6.3 Points to be observed in drafting the specification of civil engineering items – (a) Method of writing specification (b) Specification paragraph (c) Legal aspect of specification. 6.4 Types of Specification- (a) Brief Specification (b) Detailed Specification. 6.5 Types of Detailed specification. 6.6 Writing / Drafting of Detailed specification for a Few common civil engineering items such as – (a) IInd class B.B. masonry in CM - 1:6 (b) Coursed or Uncoursed rubble masonry in C.M. 1:6 (c) 12 mm thick cement Plaster in C.M. 1:5 (d) R.C.C. 1:2:4 mix.	5
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Prepare a check list of items of the following types of civil engineering works. (a) Load Bearing type Building. (Ground Floor only) (b) Frame structure type Building (Ground Floor only). (c) Water Bound Macadam Road. (d) any two from-(i) Septic tank (ii) Community well (iii) Hume pipe culvert or slab culvert (iv) Percolation Tank (v) Canal Earthwork..	Introduction, Principles of Estimating, Approximate estimate	14
02	Prepare detailed estimate of a load bearing structure of single storied residential building for all items of works , considering quantity of reinforcement in percentage.		8
03	Prepare detailed estimate of R.C.C. single storied residential building for all items of work, considering quantity of reinforcement in percentage.		8
04	Prepare the estimate of small R.C.C. hall by considering only following items of works. - (i) Quantity of cement concrete for footing, columns, beams and slabs. (ii) Quantity of steel reinforcement for above items of works by preparing bar bending schedule. (iii) Formwork for above items.		8
05	Prepare detailed estimate of road for State or National Highway of any category of road for 1 Km. length.		8
06	Prepare detailed estimate of any three of the following – (i) Septic tank (ii) Community well (iii) Hume pipe culvert or slab culvert (iv) Percolation Tank (v) Canal Earthwork.		08
07	Prepare rate analysis of following items of works for building work. (a) Excavation in any type of soil (b) IInd class B.B. masonry in C.M. 1:6 (c) 12 mmthick cement Plaster in C.M – 1:5 (d) R.C.C. mix for e.g. M20 excluding reinforcement.	Rate Analysis	04
08	Draft a specification for following items of works. (a) IInd class B.B. masonry in C.M. 1:6 (b) Coursed or Uncoursed rubble masonry in C.M. 1:6 (c) 12 mm thick cement Plaster in C.M. 1:5 (d) Reinforcement Cement Concrete mix.for e.g. M20.	Specification	04
09	Skill test		02
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	04(04)	02(00)	00(00)	06(04)
02	Principles of Estimating	04(02)	04(04)	00(00)	08(06)
03	Approximate estimate	02(02)	04(04)	04(00)	10(06)
04	Detailed Estimate.	02(00)	08 (00)	16 (12)	26(12)
05	Rate Analysis	02(00)	04(00)	06(06)	12(06)
06	Specification	00 (00)	04 (02)	04(04)	08(06)
	Total	14(08)	26(10)	30(22)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	3	R	2	4	R	2	5	R	2	1	U	2	2	U	2	3	U	2	5/7
	6	U	2																
02	1	R	4	2	R	4	2	U	4	3	U	4	4	U	4				3/5
03	4	U	4	4	A	4	5	U	4	6	U	4	3	A	4				3/5
04	5	A	4	1	R	4	2	U	4	3	U	4	6	A	4				3/5
05	4	A	6	4	A	6	5	A	6										2/3
06	4	A	6	4	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Work out quantity of the item.	10
2	Compute rate of engineering item.	10
3	Draft specification for given civil engineering item	10
2	Viva voce.	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	1	3	-	-	-	-	3	-	-	-		-
2	-	3	-	-	-	-	3	-	-	-	-	-
3	-	3	-	-	-	-	3			-		-
4	-	3	3	-	-	-	3	3	3	3	3	-
5	-	3	3	-	-	-	3	3	3	3	3	
6	-	3	3	-	-	-	3	3	3	3	3	

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Estimating and Costing in Civil Engineering	B.N. Dutta, UBS Publishers' Distributors Ltd., 2012	9788174767295
2	Estimating, Costing, Specification & Valuation	M. Chakraborty, M. Chakraborty Publishers, 2006	978-8185304366
3.	Estimating, Costing And Valuation	S. C. Rangwala, Charotar Publication House, 2015	9788185594859
4	Textbook Of Estimating and Costing (Civil Engineering)	G. S Birdie, Dhanpat Rai & Sons, 2015	978-93-84378-13-4
5	Estimating Contract & Accounts Vol -I	B. S. Patil, Orient Longman Limited, 1998	9788125002154.

❖ **E-REFERENCES:**

1. <http://www.tnhighways.gov.in/pdf/PWD%20SOR-2015-16.pdf>, assessed on 8th September 2016.
2. <https://law.resource.org/.../is.1200>, assessed on 8th September 2016.
3. www.google.co.in/search?q=1.%09cpwd.gov.in%2FPublication%2FSpecs200, assessed on 8th September 2016.
4. www.standardsbis.in/Gemini/search/Browse.action?saleModeName=HARD_COPY&subDivisionId=92, assessed on 8th September 2016.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R.N. Giradkar	H. O. D in Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. S. J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. M. K. Panchwate	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. B. R. Ambade.	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5.	Mr. M. R. Shelote	Consultant	M. R. Associates, Nagpur.
6.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering, Nagpur
7.	Mr. A. J. Fulzele	Assistant Secretary (Technical)	MSBTE, Regional Office, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE405E^s
COURSE TITLE	: TRANSPORTATION ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 Hrs
PR TEE	: 02 Hrs (External)
PT	: 01 Hr

❖ RATIONALE :

The economy of any country is widely dependent either direct or indirect way on the transportation of various commodities which in turn dependent upon the efficiency of transportation system. Therefore, knowledge and understanding of various designs, construction and maintenance aspects of roads, railways and bridges are very important for engineers working at site so as to develop their understanding in order to apply their knowledge in improving civil infrastructure for transportation.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Design road and railway track geometrics.
2. Select proper road and railway track materials.
3. Suggest proper traffic control devices.
4. Perform different test on bitumen.
5. Identify components of roadway, railway, and bridges.
6. Draw various components of roadway, railway, and bridges.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Road Alignments and Geometrics	1. Describe various Modes of transportation 2. State the factors controlling alignment of roadway 3. Describe various terms used in road geometry 4. State IRC specifications of various Geometric Elements. 5. Calculate minimum and maximum Super elevation for given situation. 6. Determine required sight distance for given situation.	1.1 Modes of transportation 1.2 Importance & Classification of roads. 1.3 Road alignment and factors controlling the alignment. 1.4 Cross section of road showing its component as per IRC. 1.5 Camber – definition, purpose, types, IRC – recommendations. Kerbs, Road margin, road formation, right of way. 1.5 Design speed , IRC – Recommendations. 1.6 Gradient - definition, types, IRC – Recommendations. 1.7 Sight distance - definition, types IRC - recommendations. 1.8 Curves - Necessity, types- Horizontal, vertical and transition curves, Extra Widening of roads. 1.9 Super elevation	14
2. Road materials and its construction aspects	1. Describe various types of road construction materials. 2. Describe various types of failures and maintenance of road. 3. Describe various types of tests on road materials. 4. Describe methods of surface and subsurface drainage. 5. Describe the defects in pavement	2.1 Types of materials used in road Construction 2.2 Necessity of Soil Stabilization and its methods. 2.4 Tests on Aggregate : Abrasion , Attrition, Impact test 2.4 Tests on Bitumen – Softening point, penetration, Ductility, flash and fire point test. 2.5 Types of Pavement. 2.5 Construction of Flexible and Rigid Pavement. 2.6 Defects in Pavements 2.7 Maintenance of roads 2.8 Purpose of drainage. 2.10 Methods of Surface and Sub-surface drainage.	8

3. Traffic Engineering.	1. Describe traffic and its characteristics. 2. Describe causes of accident with Collision diagram. 3. Suggest various traffic control devices. 4. Draw the sketches of various types of Road intersections.	3.1 Road traffic characteristics 3.2 Passenger car unit and factors affecting. 3.3 Traffic volume study. 3.4 Accident studies and its causes, Collision diagram. 3.5 Traffic control devices – road signs, Marking, Signals, traffic island. Advantages & disadvantages of signals. 3.6 Road intersections, Intersection at Grade, grade Separators.	6
4. Railway Track Basics	1. Describe the basic parts of railway track and its functions. 2. Describe the Gauges and joints. 3. Draw the different cross sections of Railway track. 4. Draw the sketches of Rail fixtures and fastenings.	4.1 Alignment- Factors governing rail alignment. 4.2 Rail track cross sections – standard cross section of BG and M.G Single and double line in cutting and embankment. 4.3 Rail Gauges – types, factors affecting selection of gauge. 4.4 Permanent ways, Ideal requirement, component parts. 4.5 Rails - function and its types. Rail Joints - requirements, types, 4.6 Sleepers - functions and Requirement, types - wooden, metal, concrete sleepers and their suitability, sleeper density 4.7 Ballast - function and different types with their properties, relative merits and demerits. 4.8 Rail fixtures and fastenings – fish plate, bearing plates, spikes, bolts, keys, anchors and anti creepers.	8
5. Railway Track Geometrics , Branching of Track and Station Yards	1. Describe creep of rail 2. Describe the causes of Creep and its preventive measures 3. Describe Grade compensation, Cant deficiency and Negative Cant 4. Describe the Necessity of Points and Crossing 5. Draw Track Layouts And Sketches of Turn Out, 6. Draw various Types of Track Turnouts 7. Describe purposes and	5.1 Creep of rail, causes and prevention of creep. 5.2 Coning of wheels, tilting of rails 5.3 Gradient and its types, 5.4 Super elevation limits of Super elevation on curves, 5.5 Cant deficiency , Negative cant, Grade compensation on curves 5.6 Definition of point and crossing, a simple split switch turnout 5.7 Sketch showing different components, their functions and working. 5.8 Line sketches of track junctions- crossovers, scissor cross over, diamond crossing, triangle.	14

	facilities at Railway Stations. 8. Describe Station Yard	Inspection of points and crossings. 5.9 Facilities Required at Railway Stations. 5.10 Requirements Of Station Yard, 5.11 Classification Of Railway Stations, 5.12 Types Of Yard	
6. Investigation and Maintenance of Bridges.	1. Draw the various views of bridge. 2. Describe the factors affecting selection of site for bridge 3. Describe terms related to bridge. 4. Describe the component parts of Bridge	6.1 Classification of bridges according to function, material, span, size, Alignment, position of HFL. 6.2 Factor affecting the selection of Bridge Site 6.3 Component of Bridge and its function, L-section, Cross section. 6.4 Basic terms: Scour, Afflux, Runoff, Economic Span, Clearance, Freeboard. 6.5 Piers-function, requirements, types. 6.7 Abutment – function, types. 6.8 Wing walls – functions and types. 6.9 Bearing – functions, types of bearing for RCC and steel bridges. 6.10 Approaches –in cutting and embankment.	14
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw the dimensional sketches of cross section of roads in Embankment and Cutting on straight and curved path on A3 size drawing sheet.	Road Alignments and Geometrics	04
2.	Perform Softening point, Penetration Test, Flash and Fire Point test, and ductility tests on Bitumen.	Road materials and its construction aspects	12
3	Prepare a report on visit to a railway track to identify various components and draw the dimensional sketches of cross section of railway track (with function of each part of track), on A3 size drawing sheet.	Railway Track Basics Railway Track Geometrics	04
4	Prepare a report on visit to a railway track to observe and draw various types of turn outs (Left hand, right hand, cross over, diamond crossing turn out)	Railway Track Geometrics , Branching of Track and Station Yards	04
5	Prepare a report on visit to a road way bridge to observe and draw L section and Cross section of its structure.	Investigation and Maintenance of Bridges.	06
Skill Assessment			02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Road Alignments and Geometrics	02(02)	08(00)	06(06)	16 (08)
02	Road materials and its construction aspects	02(00)	08(04)	00(00)	10(04)
03	Traffic Engineering.	02(00)	04(04)	00(00)	06(04)
04	Railway Track Basics	02(00)	00(04)	06(00)	08(04)
05	Railway Track Geometrics , Branching of Track and Station Yards	02(04)	08(00)	06(06)	16(10)
06	Introduction, Investigation and Maintenance of Bridges.	04(02)	04(08)	06(00)	14(10)
	Total	14(08)	32 (20)	24 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	1	R	2	5/7
	6	R	2																
02	1	U	4	1	U	4	2	U	4	2	U	4	3	U	4				3/5
03	2	U	4	3	U	4	6	R	4	4	U	4	5	R	4				3/5
04	5	U	4	5	U	4	6	U	4	6	U	4	6	U	4				3/5
05	1	A	6	4	A	6	1	A	6										2/3
06	5	A	6	6	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing/Identification	10
2	Performance	20
3	Viva Voce	20
	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	3	-
2	-	3	-	-	-	-	-	-	-	3	3	-
3	-	3	-	-	-	-	-	3	-	3	3	-
4	-	3	3	3	-	-	-	3	3	3	-	-
5	-	3	3	3	-	-	-	3	3	3	-	-
6	-	3	3	3	-	-	-	3	3	3	-	-

❖ **REFERENCE and TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Highway Engineering	S K Khanna, C E G Justo, A Veeraragavan, Nem Chand and Brothers, 10 th Edition, 2010,	978-8185240800
2	Road, Railways, Bridge and Tunnel Engg	Birdi, Ahuja, Standard Book House, 16 th Edition, March 2010	978-8189401337
3	Traffic Engineering and Transport Planning	L.R. Kadiyali, Khanna Publishers, 4 th Edition , 2008	978-8174092205
4	A text book of Railway Engineering	S.C. Saxena, S P Arora, Dhanpat Rai Publications (p) Ltd. 8 th Edition , 2010	978-8189928834
5	Principles and Practice of Bridge Engineering	S P Bindra, Dhanpat Rai Publications, 9 th Edition , 2015	978-8189928841
6	Roads, Railways, Bridges, Tunnels And Harbour Dock Engineering	B L Gupta, Standard Publishers. 5 th Edition ,2015	9788180140099
7	Road, Railway, Bridge and Tunnel Engineering	T D Ahuja and G S Birdi, Standard book house, 16 th Edition , 2012	9788189401337
8	Laboratory Manual in Highway Engineering	Duggal, Ajay K., Puri, Vijay P. New Age International (P) Limited, Publishers, 1 st Edition ,2010	9788122403107

❖ **E-REFERENCES:**

1. http://www.cdeep.iitb.ac.in/webpage_data/nptel/Civil%20Engineering/Transportation%20Engg%20I/72-homes/11-home.html, accessed on 1st November, 2016
2. nptel.ac.in/courses/105101087/downloads/Lec-2.pdf, accessed on 3rd September, 2016
3. <http://nptel.ac.in/courses/105107123/>, accessed on 3rd September, 2016
4. <https://www.youtube.com/watch?v=a-2XUcbdJiw>, accessed on 23th August, 2016
5. <https://www.youtube.com/watch?v=GuElcdfymu0>, accessed on 1st November, 2016
6. <https://www.youtube.com/watch?v=3oNa9Z94Hiw>, accessed on 1st November, 2016
7. <http://nptel.ac.in/courses/105101087/22>, accessed on 1st November, 2016
8. <http://nptel.ac.in/courses/105107123/>, accessed on 1st November, 2016
9. <http://nptel.ac.in/courses/105101087/downloads/Lec-23.pdf>, accessed on 1st November, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Softening point Test (Ring and Ball Apparatus)
2. Ductility Test (Ductility Test Apparatus)
3. Penetration Test (Penetrometer)
4. Flash and Fire point test

❖ **LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S. N.	Name	Designation	Institute / Industry
1	Mr R N Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2	Dr D K Parbat	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3	Mr P S Chindhalore	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Dr D N Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr M R Shelote	Consultant	M R Associates Nagpur
6	Dr R N Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur.
7	Mr A J Fulzele	Assistant Secretary(Tech)	MSBTE RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE406E^s
COURSE TITLE	: WATER RESOURCES ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME:	TH : 04 ; TU : 00 ; PR : 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs.
PR. TEE	: 02 HRs (External)
PT	: 01 HR.

❖ RATIONALE:

Water resource engineering is an important civil engineering subject as our country being an agricultural country its significance in Indian condition is great. This is specially due to water needed for the cultivation throughout the year but irregular rainfall obtain mostly in 3 to 4 months of the year Thus whatever water obtained is required to be store and use carefully throughout the year. Similarly the water tapped from wells, tube-wells & other sources has to be transported over a long distance to supply crops of different type.

To fulfill the crop requirement of the nation, the cultivation of various crops is required to be carried out throughout the year. Thus irrigation plays the vital role to fulfill the water requirements of the crop. It is essential that technicians in civil engineering become aware of basic background of theory & practice and acquire the skill of understanding the importance & necessity of various irrigation structures. The purpose of learning this course is to prepare students to efficiently supervise and construct & maintain various irrigation structures.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Determine reservoir levels using hydrological data and crop water requirement.
2. Recognize planning, construction, operation, maintenance and repair aspect of dams and other irrigation structure.
3. Select appropriate irrigation structure for given situation.
4. Draw labelled typical cross section of Earthen Dam, Weir, cross drainage works and Canal related works.
5. Draw labelled sketches of various minor irrigation schemes.
6. Prepare a visit Report of Irrigation structure.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Hydrology	1. Define irrigation 2. Enlist benefits of irrigation 3. Classify irrigation scheme 4. Define hydrologic cycle 5. Define Rainfall 6. Enlist Factors affecting rainfall 7. Define Run-off 8. Enumerate methods of computing runoff 9. Define MFD and methods of determining MFD 10. Calculate average rainfall and maximum flood discharge	1.1 Definition of irrigation Concept, necessity 1.2 Scope and development of irrigation in India. 1.3 Benefits of Irrigation 1.4 possible ill effects of over-irrigation 1.5 Types of irrigation schemes, single & multipurpose projects. 1.6 Hydrological Cycle 1.7 Rainfall, Factors affecting rainfall 1.8 Rain gauge- Symons and automatic rain gauge 1.9 Average Rainfall calculations 1.10 Catchment area, definition & types 1.11 Run-off- Definition, factors affecting runoff 1.12 Calculation of run-off from 1. Rainfall records, 2. River gauging 3. Inglis formula 1.13 Max. Flood discharge from catchments area, Purpose & methods of determination by using: (a) Inglis formula, (b) Past flood records 1.14 Numerical on average rainfall and maximum flood discharge 1.15 Yield and dependable yield of a catchment	09
2. Water requirement of crop	1. Describe cropping seasons 2. Name different systems of applying water to the crop 3. Define base and crop period 4. Define Duty and Delta 5. Enlist factors affecting duty 6. Classify command area 7. Calculate duty, delta and base period 8. Find CWR and capacity of canal	2.1 Crops and cropping seasons in Maharashtra 2.2 Kharip, Rabi, Hot weather & Perennial 2.3 Study of different systems of applying water to the crop 2.4 Base period, Crop period for a crop 2.5 Concept of Duty and Delta 2.6 Factors affecting duty 2.7 Methods of improving duty	08

		2.8 Gross, Culturable and Irrigable command area 2.9 Definition of time factor, capacity factor, 2.10 Numerical on water requirements and capacity of canal	
3. Reservoir planning	1. Classify surveys for reservoir planning 2. Define area – capacity curve 3. Describe Methods to reduce silting 4. Enumerate storage of reservoir 5. Calculate control levels of reservoir	3.1 Different surveys for reservoir planning 3.2 area – capacity curve 3.3 silting of reservoir and Factors affecting silting 3.4 Methods to reduce silting 3.5 Calculation of dead storage, live storage and gross storage 3.6 Flood absorption capacity of reservoir 3.7 Fixing control levels – dead storage level, Full reservoir level, high flood level and top of bund level 3.8 Simple calculations of fixing of control levels. numerical	09
4 Dams and spillways	1. Classify dams 2. Describe forces acting on dam 3. Describe theoretical and practical profile 4. Describe joints in concrete dam 5. Describe earthen dam 6. Draw cross section of an earthen dam 7. Describe causes of failure of earthen dam 8. State purpose of spillway 9. Write formula of discharge over spillway 10. Describe energy dissipation of spillway and its types 11. Describe Radial gate	4.1 Types of dams- Gravity and Earthen dams, choice of type of dam 4.2 Gravity dams – Forces acting on dams 4.3 Theoretical and practical profiles 4.4 Drainage gallery 4.5 Transverse and longitudinal joints in concrete dam. 4.6 Earthen dams – Components of earthen dam and their function 4.7 Typical cross section of an earthen dam 4.8 Seepage through earthen dams 4.9 Methods to reduce seepage through embankment and foundation 4.10 Construction procedure of earthen dams 4.11 Causes of failure 4.12 Outlets through earthen dams 4.13 Spillways- purpose, 4.14 Types-emergency, service, ogee	14

		4.15 Discharge over spillway 4.16 Energy dissipation of spillway-types 4.17 Radial gate	
5 Minor irrigation	1. List the component parts of bandhara 2. Describe the advantages & disadvantages of bandhara 3. Describe construction of Kolhapur type bandhara 4. Describe Percolation tank 5. Describe construction and operation of weir 6. List the different component of barrage 7. State necessity of diversion head work 8. Describe advantages and disadvantages of Lift irrigation, sprinkler and drip irrigation	5.1 Bandhara- Component parts of Bandhara 5.2 advantage and disadvantage 5.3 construction of Kolhapur type bandhara 5.4 Percolation tank – Necessity and selection of site 5.5 Weir-component parts, types 5.6 Barrages – Components and their functions 5.7 Comparison between weir and barrage. with respect of crest level, afflux during flood, silting, maintenance cost 5.8 Diversion head work - necessity 5.9 Layout of diversion head work with its components and their function 5.10 Lift Irrigation-advantages and disadvantages of Lift irrigation 5.11 Sprinkler and drip irrigation- 5.12 Layout of scheme and component parts 5.13 Merits & demerits	12
6. Canals and canal cross drainage works	1. Classify canals 2. Define critical velocity 3. Define balancing depth of canal 4. Find balancing depth of canal 5. Describe canal falls and its types 6. List the common material used for canal lining 7. Describe the properties determining the suitability of lining material 8. Define Canal Cross drainage work 9. Describe each type of CD work 10. Describe canal escapes 11. Enumerate causes of water logging 12. State remedial measures	6.1 Classification of canals according to alignment - 6.2 Ridge, contour, side slope canal 6.3 Types of canal according to position in network – 6.4 Main canal, branch canal, distributaries and field canals 6.5 Typical canal section 6.6 Definition of Critical velocity, expression of critical velocity given by Kennedy and critical velocity ratio (no Numerical) 6.7 Balancing depth of canal- Definition and Numerical 6.8 Falls- Definition and Types- Sarda Fall, glacier fall 6.9 Canal lining – purpose and common material used 6.10 Properties determining the	12

	taken for water logging.	suitability of lining material 6.11 Advantages of canal lining 6.12 Canal Cross drainage work- Definition 6.13 Types- aqueduct, siphon aqueduct, super-passage, level crossing 6.14 Canal cross regulator and canal head regulator 6.15 Simple or non-modular outlets on canal 6.16 Escapes- purpose 6.17 Water logging-Causes of water logging, effect of water logging, prevention and remedial measure against water logging	
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Detailed sketches of following on A4 size plate			
1.	Draw typical cross-section and layout of drainage in earthen dam	Dams and spillways	04
2.	Draw cross-section of earthen dam as per locally available material (any three type)	Dams and spillways	04
4.	Draw sketch of Ogee spillway with gate and energy dissipation arrangement	Dams and spillways	04
5.	Draw Kolhapuri type weir (plan & sectional elevation)	Minor irrigation	04
6.	Draw Diversion head work, detailed sketch of any one component of it. (Divide wall / Silt excluder / Fish ladder)	Minor irrigation	04
7.	Draw Layout of lift irrigation scheme with river as source	Minor irrigation	02
8.	Draw sketch of any Canal cross- drainage work i.e. Aqueduct, super passage, level crossing (Any one)	Canals and canal cross drainage works	04
9.	Prepare detailed reports with sketches on the visit to Irrigation structures(e.g. dam, spillway or Irrigation canals structures)	All Units	04
Skill Assessment			02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Hydrology	00(02)	04(00)	06(00)	10(02)
02	Water requirement of crops	04(00)	08(04)	06(06)	18(10)
03	Reservoir planning	02(00)	04(04)	06(06)	12(10)
04	Dams and spillways	04(04)	08(04)	00(00)	12(08)
05	Minor irrigation scheme	02(00)	04(04)	00(00)	06(04)
06	Canals and Canal cross drainage works	02(02)	04(04)	06(00)	12(06)
	Total	14(08)	32(20)	24(12)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	2	R	2	3	R	2	5	R	2	6	R	2	1	R	2	5/7
	6	R	2																
02	1	U	4	2	U	4	4	R	4	2	U	4	3	U	4				3/5
03	2	U	4	3	U	4	3	U	4	4	R	4	4	U	4				3/5
04	4	U	4	5	U	4	6	U	4	5	U	4	6	U	4				3/5
05	1	A	6	2	A	6	3	A	6										2/3
06	3	A	6	6	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Sketch to suitable scale	20
2	Description	10
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	3	-	-	-	-	-	-	-	3	3	-
4	-	3	2	-	-	-	-	2	2	3	-	-
5	-	3	2	-	-	-	-	2	2	3	3	-
6	-	3	2	-	-	-	-	2	2	3	3	-

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

❖ **REFERENCE & TEXT BOOKS:**

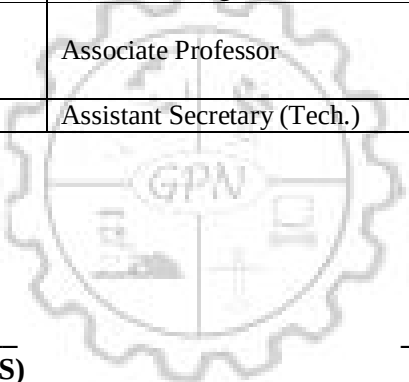
S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Irrigation and Water Power Engineering	B. C. Punmia, B. B. Pande . Standard Publisher. 6 th Edition 2015	8131807637
2.	Irrigation and Hydraulic Structure	S. K. Garg, Khanna Publisher, New Delhi, 2010.29 th Edition 2015	8174090479
3.	Irrigation and Water Resources Engineering	G. L. Asawa New Age International, 2006	8122416738
4.	Irrigation Engineering	N. N. Basak, Tata Mcgraw Hill 10 th Edition 2007	0074635387
5.	Irrigation Engineering	R. K. Sharma, T. K. Sharma, S. Chand and Co., 2 nd Edition 2004	8121921287

❖ **E-REFERENCES:**

- www.damsinternational.com accessed on 1st September, 2016
- www.dams.org accessed on 1st September, 2016
- www.narmada.org accessed on 1st September, 2016
- www.guj.nwrws.gujrat.gov.in accessed on 1st September, 2016
- www.rajjirrigation.gov.in accessed on 1st September, 2016
- www.mahairrigation.gov.in accessed on 1st September, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. N. H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Dr. S. J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. M. R. Shelote	Consultant Engineer	M R Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
6.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE407E^s
COURSE TITLE	: ENVIRONMENTAL ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU:00;PR:02(CLOCK HRS.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)
TH. TEE	: 03 HRS;
PR.TEE	: 02 HRS (External)
PT	: 01 HR.

❖ **RATIONALE:**

Environmental engineering encompasses the scientific assessment and development of engineering solutions to environmental problems impacting the water, wastewater and solid waste. The course covers the physical, chemical and biological principles of process design and treatment of water and wastewater. With a view to provide adequate water supply of required quality and quantity to every village, town and city, also provide an efficient method of sewage treatment, its disposal and effective solid waste management the knowledge of Environmental engineering is essential.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Estimate the total water demand for a city.
2. Identify the methods of collection and safe disposal and treatment of Solid waste.
3. Identify the different components of building sanitation and type of Sewerage system.
4. Determine various characteristics of water to check potability.
5. Perform different test on waste water.
6. Design a Septic tank for small community.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Demand of water	1. Describe need for protected water supply 2. Identify water borne diseases 3. Identify surface and subsurface sources of water 4. Define intake structures and types 5. Compute various types of water demand, 6. Describe rate of demand 7. Identify factor's affecting rate of demand 8. Analyze design period for water supply scheme 9. Compare methods of forecasting of population. 10. Compute numerical problem on forecasting of population 11. Estimate of total quantity of water for a town/city	1.1 Need for protected water supply, water borne diseases 1.2 Surface and subsurface sources of water 1.3 Intake structures definition and types. 1.4 Demands of water – Domestic, Industrial, Commercial, Public, Fire demand, Losses and wastages 1.5 Rate of demand, Factor's affecting rate of demand, variations of rate of demand 1.6 Design period for water supply scheme 1.7 Forecasting of population – Methods of forecasting, Numerical problem on forecasting of population 1.8 Estimation of total quantity of water for a town/city	06
2. Quality of water and Treatment of water	1. Define potable water. 2. Classify impurities present in water 3. Classify different test on water physical test, chemical test and bacteriological test 5. State water quality standards as per IS specifications. 6. Describe different water treatment on water 7. Define various water treatment process.	2.1 Meaning of potable water 2.2 Impurities present in water and it's classification 2.3 Need for analysis of water 2.4 Tests on water- Physical test for Colour, Taste, Odour and Turbidity; Chemical test for total solids, Hardness, Chlorides, Dissolved oxygen, pH, Fluoride, Nitrogen and it's compounds; Bacteriological test – E coli index, MPN. 2.5 Sampling of water, Precautions to be taken for collection of samples. 2.6 Water quality standards as per IS specifications 2.7 Aeration – Objects and method, aeration fountain	06

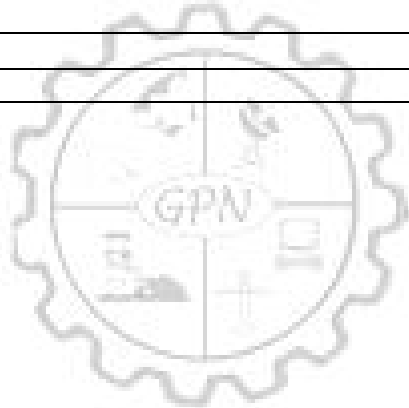
		2.8 Sedimentation – objects, plain sedimentation, sedimentation with coagulation, principles of coagulation, types of coagulation, process of coagulation, Types of sedimentation tanks, study of clari-flocculator and its working. 2.9 Filtration – objects and theory of filtration, filter media, classification of filters: Slow sand filters, rapid sand filters, construction, working and design aspects of slow sand filter and rapid sand filter, suitability merits and demerits, back working of rapid sand filters. 2.10 Disinfections - objects and methods, Chlorination – different forms, Application of chlorine, Residual chlorine and it's importance. 2.11 Components of water treatment plant	
3. Conveyance and Distribution of water	1. Identify different types of pipes used for conveyance of water, 2. Compare choice of pipe material used in pipe lines. 3. Describe the joints in cast iron pipes and concrete pipes 4. Describe procedure of the laying of pipes, 5. Describe the testing of pipe line – pressure test and leakage test 6. Describe the valves, its types and utility of the valves. 7. Compare methods of distribution Of water- Gravity, pumping and combined system. 8. Identify the layouts of various types of water distribution system. their suitability, merits and demerits	3.1 Different types of pipes used for conveyance of water, choice of pipe material 3.2 Joints in cast iron pipes and concrete pipes 3.3 Laying of pipes, testing of pipe line – pressure test and leakage test 3.4 Valves – types, functions, use and location on a pipe line 3.5 Methods of distribution of water- Gravity, pumping and combined system. 3.6 Layouts of water distribution system. – Dead end, Grid iron, Circular and radial system; their suitability, merits and demerits	08

4. Building sanitation , Sewerage and Sewer appurtenances	1. Define the terms related Sanitary Engineering. 2. List various Building sanitary fittings and fixtures, 3. Compare system of sewerage – Separate system, Combined system, Partially se 4. State types of sewers – Their comparison, suitability and selection 5. Describe System of sewerage 6. Describe laying, testing and maintenance of sewers 7. Describe manholes and drop Manhole with neat sketch: their component parts and location, 8. Describe types of sewers 9. Compare various types of sewers 10. Select types of sewers for suitable applications.	4.1 Necessity of building sanitation Term – Sewage, sullage, refuse, garbage, rubbish, storm water, domestic sewage 4.2 Building sanitary fittings- Water closet, Flushing cistern, Wash basin, Sink, Urinals, Traps – Types, their function and location. Inspection chambers. 4.3 System of sewerage – Separate system, Combined system, Partially separate system, their comparison and suitability 4.4 Types of sewers – Their comparison, suitability and selection 4.5 System of sewerage 4.6 Laying, testing and maintenance of sewers 4.7 Manholes and drop Manhole: their component parts, location, Types of sewers – Their comparison, suitability and selection 4.8 spacing, construction details, sewer inlets street inlets	10
5. Treatment of sewage	1. Analyze the characteristics of sewage, B.O.D. / C.O.D. and it's significance, 2. Compare aerobic and anaerobic process 3. State the function of sewage treatment plant, Grit chamber, skimming tank, sedimentation tank, sludge digestion tank, trickling filters, 4. Describe the activated sludge process 5. Design septic tank, Explain Oxidation pond	5.1 Characteristics of sewage, B.O.D. / C.O.D. and it's significance, Aerobic and anaerobic process 5.2 Objects of sewage treatment general layout and flow diagram of sewage treatment plant, Grit chamber, skimming tank, sedimentation tank, sludge digestion tank, trickling filters, Activated sludge process 5.3 Disposal of sewage, septic tank, Oxidation pond	12
6. Solid waste and industrial waste	1. Enlist common constituents of dry refuse 2. Describe method of collection and disposal of dry refuse 3. State Characteristics of industrial waste water from following industry- Sugar, Dairy, Textile,	6.1 Dry refuse, common constituents of dry refuse 6.2 Collection and method of disposal of dry refuse 6.3 Industrial waste water, Characteristics of industrial waste water from following industry- Sugar, Dairy, Textile, Paper and pulp.	06

	Paper and pulp. 4. Describe with neat sketch, general idea regarding disposal of waste water from above industries	6.4 General idea regarding disposal of waste water from above industries.	
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Determine the pH of a given water sample by using digital p ^H meter.	2	04
02	Determine the turbidity of the given sample by using Turbidity meter	2	04
03	Determine residual chlorine of a given sample by Orthotolidine test	2	04
04	Determine optimum dose of coagulants in given water sample by jar test	2	04
05	Determine the dissolved oxygen of a given water sample	5	04
06	Design and draw of septic tank and soak pit for hostel on half imperial sheet	5	04
07	Prepare a report on to the water treatment plant by conducting a visit.	3	04
08	Prepare a report on sewage treatment plant by conducting a visit.	5	02
Skill Assessment			02
Total Hrs			32



❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Demand of Water	00(04)	08(00)	---	08(04)
02	Quality of Water and Treatment of Water	04(00)	08(04)	04(04)	16(08)
03	Conveyance and Distribution of Water	02(00)	04(04)	--	06(04)
04	Building Sanitation of Sewerage and Sewer Appurtenances	04(00)	00(04)	10(04)	14(08)
05	Treatment of Sewage	--	08(06)	06(04)	14(10)
06	Solid Waste and Industrial Waste	02(00)	04(00)	06(06)	12(06)
	Total	12(04)	32(18)	26(18)	70(40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	2	R	2	3	R	2	4	R	2	4	R	2	1	R	2	5/7
	1	R	2																
02	1	U	4	1	U	4	2	U	4	2	U	4	2	A	4				3/5
03	2	U	4	2	U	4	3	U	4	4	U	4	3	U	4				3/5
04	4	A	4	5	U	4	6	U	4	6	U	4	4	A	4				3/5
05	4	A	6	5	A	6	6	A	6										2/3
06	6	A	6	6	A	6	5	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S. N.	Description	Max. Marks
1	Performance of practical; Selection of Chemicals, Observation, Calculations, Result	30
2	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	-
2	-	3	-	-	-	-	-	-	-	3	-	-
3	-	3	-	-	-	-	-	3	-	3	-	3
4	-	3	3	2	-	-	-	3	2	3	-	3
5	-	3	3	2	-	-	-	3	2	3	-	3
6	-	3	3	2	-	-	-	3	2	3	-	3

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Water Supply and Sanitary Engineering	G. S. Birdie, J. S. Birdie, Standard Publishers Distributors	8187433795, 9788187433798
2.	Water Supply And Sanitary Engineering	S. C. Rangwala Charotar Publishing House, 2005	8185594597, 9788185594590
3.	Elements of water supply and wastewater disposal	Gordon Maskew Fair; John C New York u.a. : Wiley u.a., 1981harles Geyer; Daniel A Okun	0470390980
4.	Water Supply Engineering	B. C. Punmia, Laxmi Publications; Second edition, 2016	8131807037 978-8131807033
5.	Wastewater Engineering (Including Air Pollution)	B. C. Punmia, Arun Kumar Jain, Ashok Kumar Jain, Laxmi Publications; Second Edition, 2016	8131805964 978-8131805961

• **E-REFERENCES:**

- www.leka.lt/sites/default/files/dokumentai/concise-environmental-engineering.pdf accessed on 31st August, 2016.
- www.tnu.edu.vn/sites/quynhhtt/references/8064517-Environmental-Engineering.pdf accessed on 31st August, 2016.
- bookboon.com/en/environmental-engineering-ebooks, accessed on 31st August, 2016.
- <https://www.engr.udel.edu/downloads/UndergradEnvironmental.pdf> accessed on 31st August, 2016.
- <https://www.youtube.com/watch?v=syn4lUvF3YE> accessed on 31st August, 2016.
- <https://www.youtube.com/watch?v=yZJbgimr5hg> accessed on 31st August, 2016.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Digital pH meter
2. Water analysis kit
3. BOD incubator
4. Jar Test Apparatus
5. Orthotolidine Test Apparatus
6. Digital Turbidity meter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. N. U. Sulbhewar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. B. R. Ambade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Ms. D. A. Khandare	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5.	Mr. M. R. Shelote	Consultant Engineer	M. R. Associates, Nagpur.
6.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
7.	Mr. A. J. Fulzele	Assistant Secretary (Technical)	MSBTE, Regional Office, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE408E
COURSE TITLE	: BUILDING SERVICES
PRE-REQUISITE	: CE402E
TEACHING SCHEME:	TH: 00; TU: 00; PR :04
TOTAL CREDITS	: 02(1 TH/TU CLOCK HR = 1 CREDIT. 1 PR CREDIT. = 02CLOCK HR)
TEE	: NIL
PR.TEE	: 02 Hr. (Internal)
PT	: NIL

❖ **RATIONALE:**

Building cannot be used for occupancy unless various services required for effective working of a building are provided. Building services includes designing, installing & servicing everything that is needed to make buildings comfortable, safe & convenient. Good building services create a healthy & conducive working environment. Therefore every Civil engineering students should develop skills in the field of building services. A Civil Engineer, with adequate knowledge of building services shall be able to work closely with Construction Professionals, Structural Engineers, electrical engineers etc.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Plan various building services required in residential , public and commercial buildings
2. Identify various building fittings, sanitary fixtures & type of building drainage systems.
3. Suggest suitable water proofing/ damp proofing and termite proofing treatments.
4. Choose the wire/cable, accessories and wiring methods.
5. Measure earth resistance of earth electrode using earth tester.
6. Test wiring installation using megger.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw line diagram showing the one pipe and two pipe plumbing system for residential building. Prepare report stating - - Objectives of plumbing, - Purpose of plumbing, - Systems of plumbing – One Pipe system, Two Pipe system, Plumbing arrangement for high rise buildings - Advantages and disadvantages of both.	Elements of plumbing	04
2.	Draw neat sketches related to followings. Use A4 size sheets. - Building sanitary fittings – water closets, flushing appliances, urinals, washbasins, flushing cisterns, - Traps & their types, Capacity & sizes of pipes, soil pipe, waste pipe, rain water pipe, Prepare report stating - - Principles of building drainage, - Installation of pipes, testing of pipes etc.	Sanitary fixtures & Building drainage system	04
3.	Draw neat sketches of following. Use A4 size sheets. Sluice valve, Reflux valve, Scour valve, Air relief valve, Pressure relief valve, Gate valves. Bio-taps & Stop valve, Self closing valve, Flush valve.	Valves & Terminal Fittings	04
4.	Draw layout plan for Flat scheme G+2 showing following details for water supply. Use A2 size sheets. Service pipe, communication pipe, consumer pipe, water meter, rain water pipes - Plumbing fittings - Valves & Terminal Fittings - Building drainage system - Pipes joints & fittings		08

5.	Prepare line plan drainage system of Flat scheme G+2 showing following details. Use A2 size sheets. • Inspection chambers, sewage pipes, traps, man holes etc. • Sanitary fixtures and Building drainage system, • Valves and Terminal Fittings, Pipes joints and fittings		08
6.	Prepare a report on Water Proofing /Damp Proofing Treatment provided in a building by visiting any construction site and observing the procedure for it. Report includes- • Introduction to water proofing/ damp Proofing, • Material required for water proofing, • Terrace and basement water proofing, • Precautions to be taken while water proofing.	Water Proofing Treatment/ Damp Proofing	02
7.	Prepare report on termite proofing Report includes- • General principles of termite proofing, • Methods of termite proofing. • Perform Market survey and prepare a list of termite proofing materials available in local market with their suitability.	Termite Proofing	02
8.	Operate firefighting equipment on fire and execute safety precautions in laboratory. • Prepare report stating - • Need for electrical safety measures, • Causes of accidents, • General electrical safety rules, • Fire, Causes of Fire, • Basic ways of extinguishing the fire, • Classification of fire, • Fire fighting equipments, Class A, B, C, D, fire extinguishers.	Electrical Safety	04
9.	Identify following wiring accessories and draw IS symbols. • Controlling accessories, • Holding accessories, • Safety accessories, • Outlet accessories, • General accessories	Electrical Wiring Installation	04
10.	Perform stair case wiring OR to control two lamps from two single pole one way switch on wiring board using PVC conduit wiring method.		04
11.	Test wiring installation using megger.		02
12.	Measure earth resistance of earth electrode using earth tester.		02

13.	Draw an electrical installation plan and single line diagram of the electrical circuits of 1BHK residential unit.		06
14.	Draw plan and section of lift room show connection of lift motor from main switch board.	Lifts and Escalators	06
Skill Assessment			02
Total			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

NIL

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Draw neat labeled sketches of various building services components /wiring /circuit diagram/ selection of material/writing procedure etc.	30
2	Viva -Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	--	--	--	3	3	3	3	--	3	2	--
2	3	--	--	--	--	3	--	--	--	3	2	--
3	3	--	--	--	3	3	--	--	--	3	2	--
4	3	--	--	--	3	3	3	3	--	3	--	--
5	--	--	--	--	3	3	3	3	2	3	--	--
6	--	--	--	--	3	--	3	3	2	3	--	--

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Plumbing :Design& Practice	S.G. Deolalikar, Tata McGraw-Hill Education Pvt. Ltd., 2004	10: 007462069X 13: 9780074620694
2	Building Construction: Design Aspects of Leakage and Seepage Free Buildings	Krishna Kant, Tata McGraw-Hill Education Pvt. Ltd, 2012	10: 1259006069 13:9781259006067
4	Electrical Design Estimating and Costing	K.B. Raina, Dr. S.K. Bhattacharya, New Age International Publisher, First, Reprint 2010	10:81-224-0363-8 13:978-81-224-0363-3
5	A Course in Electrical Installation Estimating & Costing	J B Gupta, S K Kataria & Sons, Reprint, 2013	13:9789350142790 10:8188458996
6	National Electrical Code 1985.	Bureau of Indian Standards	----

7	IS: 732-1989, Code of practice for electrical wiring installation	Bureau of Indian Standards	----
8	National Building Code 2005	Bureau of Indian Standards	-----

❖ **E-REFERENCES:**

- <http://nptel.ac.in/courses/108108076/1> , accessed on 28 July 2016
- <http://www.electrical4u.com> , accessed on 18th January 2016
- <https://www.youtube.com/watch?v=A9KSGAnjo2U>, accessed on 18th January 2016.
- <https://www.youtube.com/watch?v=BmwdSoGBllg> accessed on 16 mar 2016.
- www.electricaltechnology.org › EE Review accessed on 16 mar 2016.
- <http://www.slideshare.net/gauravhtandon1/lifts-escalators> on accessed on 5 Jul 2016.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Tool box (all wiring tools).
2. Megger 500V/1000V Hand driven
3. Earth tester 3 spike.
4. Digital Multi-meter
5. Tong tester.
6. Different size wiring accessories.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head, Civil Engineering	Government Polytechnic, Nagpur
2.	Ms. D.A. Khandare	Lecturer in Civil Engineering	Government Polytechnic, Nagpur
3.	Mr. N U Sulbhewar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur
4.	Mr. N.H. Adkine	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
5.	Mr. M. R. Shelote	Consultant	MR Associates, Nagpur
6.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
7	Mr. A.J. Fulzele	Assistant Secretary (Tech)	MSBTE,RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME : PROFESSIONAL COURSES
COURSE CODE : CE409E
COURSE TITLE : CONTRACT, ACCOUNT& VALUATION
PREREQUISITE : Nil
TEACHING SCHEME : TH: 00; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS : 02 (1 TH/TUCREDIT HR = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH TEE : NIL
PR TEE : 02 HRs (Internal)
PT : NIL

RATIONALE : This course will enable the student to know the different facts, concepts, & procedure of valuation of property, tender and tender documents, contract procedure in Public Works Department (P.W.D.), working knowledge of stores and stock account, preparation of contractor's bill, material accounts etc. It will also enable the students to know about the various formats used by P.W.D. for accounting purpose.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Compute the valuation of property.
2. Evaluate depreciation of property.
3. Draft tender notices for various civil engineering works.
4. Customize with tender and tendering procedures.
5. Identify the various types of contract and its procedure.
6. Conduct the procedure of maintaining accounts of materials at site, road metal return Accounts, Imprest cash accounts, and store and stock account

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare the valuation of a small residential building or flat.	Valuation	8
2.	Record the measurements of work done of superstructure of existing building.	Detailed estimate	8
3.	Prepare R. A. bills, first & final payment bill, filling of forms of materials at site.	Payments to the contractor	6
4.	Evaluate simple problems on depreciation by four methods	Valuation	8
5.	Collect the tender notices published in news papers for – (a) W.B.M. road (b) Residential Building © Any three civil Engineering structure except (a) & (b) of Govt. depts. / Undertaking Govt. depts. / Public (Local) bodies	Tender Notice	8
6.	Collect old set of Tender documents & compose a report on it.	Tender documents	6
7.	Prepare a Tender document stated below for W.B.M. road or Residential building Covered in estimating and costing (CE.....) (a) Tender Notice (b) Tender Agreement (c) Condition of contract (related with W.B.M. Road or Residential Building) (d) Schedule A (e) Schedule B	Tender documents	10
8.	Collect the various accounts forms stated below from P.W.D. and writing on it. (a) Ruling the forms of nominal Muster Roll. (All three type) (b) Measurement book (c) Daily labor Report. (d) Rate list. (e) Form of materials at site account. (f) Road Metal Return account. (g) Form of Indent for issue of materials.	P.W.D. accounts	8
Skill Assessment			2
Total			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

NIL

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	10
2	Calculation	10
3	Result	10
4	Viva Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	2	-	2	1	-	2	3	3	3	3	-
2	-	2	-	2	-	-	2	3		3	3	-
3	-	2	-	-	1	-	-	3	3	3	3	-
4	-	2	-	-	-	-	-	-	-	-	-	-
5	-		-	-	-	-	-	-		-	-	-
6	-	2	-	-	1	-	-	-	3	-	3	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Valuation Of Real Properties	S. C. Rangwala, Charotar Publication, 10 th Edition, 2015	978-93-85039-01-0
2.	Contracts and Estimating	B. S. Patil, Universities Press, 3 rd Edition, 2006	8173715599 978-8173715594
3.	Estimating, Costing, Specification and Valuation in Civil Engineering	M. Chakraborty, Chakraborti, 2006	10: 818530436X 13: 978-8185304366
4.	Estimating and Costing in Civil Engineering Theory and Practice Including Specifications and Valuation	B. N. Datta, UBS Publisher, Distributor Pvt. Ltd., 25 th Edition, 2002	10: 8174767290 13: 978-8174767295
5.	Text book of Estimating and Costing	G. S Birdie, Dhanpat Rai and Sons, 7 th Edition, 2015	9789384559519

❖ **E-REFERENCES:**

- [https://en.wikipedia.org/wiki/Valuation_\(finance\)](https://en.wikipedia.org/wiki/Valuation_(finance)) , assessed on 3rd October, 2016
- <https://www.mbqld.com.au/contracts-and-disputes/contract-> assessed on 3rd October, 2016
- <https://www.youtube.com/watch?v=QSJKmUAE22M> assessed on 3rd October, 2016
- www.assetworks.com › Asset Mgt Blog assessed on 3rd October, 2016
- <https://www.maharashtratourism.gov.in/mtdc/tender-notices> assessed on 3rd October, 2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	R.N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	M. K. Panchawate	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	S. R. Kukadapwar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. M. R. Shelote	Consultant Engineer	M. R. Associates, Nagpur.
5	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management ,Nagpur
6	Mr. A. J. Fulzele	Assistant Secretary (Technical)	MSBTE, RO, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE410E ^S
COURSE TITLE	: ROAD PROJECT
PREREQUISITE	: CE405E
TEACHING SCHEME	: TH:00; TU:00; PR:04 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 0 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (External)
PT.	: NIL

❖ RATIONALE

Road transportation is important, largest and basic mode of transportation in India. It is one mode which could give maximum service to all. It is also easy and effective mode of transportation. There is vast scope of road development work and its maintenance in our country. Students of Diploma in Civil Engineering have good job opportunities in this field. Students could work as a technician in P.W.D. and road construction organization or they can take the road construction works on contract basis. This subject gives the knowledge and skills required to carry investigation, planning, design, construction and maintenance works of the roads.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select the site for alignment of new road.
2. Carry out detailed profile survey of road and CD Work.
3. Set horizontal curve for road.
4. Plot the profile cross sections of the ground across the alignment.
5. Identify the defects in Rigid and Flexible Pavement.
6. Perform the traffic volume survey.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Carry out the Road survey for a road of minimum 0.5 km. length having at least one small cross drainage work. 1.1 Site selection. 1.2 Reconnaissance survey. 1.3 Fixing the alignment. 1.4 Detailed profile survey along the alignment and cross section of road and CD Work.	Road Survey	22
2	Set out the simple horizontal curve on alignment (any one)		06
3	Prepare drawing of longitudinal section and typical cross sections of the road in cutting and filling.	Road Geometrics	06
4	Prepare a report on visit to a road to analyze various defects in rigid and flexible pavements.	Road maintenance	08
5	Carry out Traffic volume study and its representation of an important road intersection or roadway in your city.	Road Traffic Survey	18
Total			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

NIL

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	10	--	Field Book	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Task on project work.	30
2	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	3	-
2	-	3	3	-	-	-	-	3	3	3	3	-
3	-	3	3	-	-	-	-	3	3	3	3	-
4	-	3	3	2	-	-	-	3	3	3	-	-
5	-	3	-	-	-	-	-			3	-	-
6	-	3	3	2	-	-	-	3	3	3	-	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Highway Engineering	S K Khanna, C E G Justo, A Veeraragavan, Nem Chand and Brothers, 10 th Edition, 2010,	978-8185240800
2.	Traffic Engineering and Transport Planning	L.R. Kadiyali, Khanna Publishers, 4 th Edition , 2008	978-8174092205
3.	Road, Railway, Bridge and Tunnel Engineering	T D Ahuja and G S Birdi, Standard book house, 16 th Edition , 2012	9788189401337
4.	Roads, Railways, Bridges, Tunnels And Harbour Dock Engineering	B L Gupta, Standard Publishers. 5 th Edition ,2015	9788180140099

❖ **E-REFERENCES:**

- <http://nptel.ac.in/courses/105101087/11>, accessed on 1st November, 2016
- <http://nptel.ac.in/courses/105107123/>, accessed on 3rd September, 2016
- <http://nptel.ac.in/courses/105101087/downloads/Lec-6.pdf>, accessed on 1st November, 2016
- <https://www.youtube.com/watch?v=a-2XUcbdJiw>, accessed on 23th August, 2016
- <http://nptel.ac.in/downloads/105101008/>, accessed on 1st November, 2016
- <http://nptel.ac.in/courses/105107122/modules/module11/html/37-2.htm>, accessed on 1st November, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Not Applicable

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr R N Giradkar	Head of Civil Engineering Deptt	Government Polytechnic, Nagpur.
2.	Dr D K Parbat	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr M R Shelote	Consultant	M R Associates Nagpur
5	Dr R N Khapre	Associate Professor	Ramdeobaba College of Engineering and Management ,Nagpur
6	Mr A J Fulzele	Assistant Secretary(Tech)	MSBTE RO Nagpur

(Member Secretary PBOS)

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE411E
COURSE TITLE	: APPLICATION OF CAD
PREREQUISITE	: CA201E
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRS.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)
TH. TEE	: NIL
PR.TEE	: 02 HRS (Internal)
PT	: NIL

❖ RATIONALE:

All civil engineering works required sets of working drawings for execution of work. This sets of drawings were earlier prepared manually, which resulted in time consuming process, repetition of work for editing again resulted in wastage of stationary and time of human resources. With the advances in computer hardware and software like AUTOCAD, Computer Aided Drawing is being used widely for preparation of drawings with high precision and using less time compared to manual drafting. Hence, it becomes mandatory for the students of diploma in civil engineering to have skills of drawing of civil engineering structures by using advanced CAD software of computers. This course is designed to develop these skills.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Create, save CAD drawing files & modify particular building drawing
2. Use drafting set-up.
3. Modify and edit 2D commands.
4. Prepare line plan for residential building Using CAD commands.
5. Draw developed plan, elevation, and section with Auto CAD.
6. Prepare Submission drawing/ working drawing of buildings with Auto Cad.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

❖ **B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Identify and locate components of CAD classic screen by using File menu of New, Open, Save, Save as and Close.	Fundamental of cad	04
2.	Identify Editing commands – copy, move, offset, , chamfer, trim, stretch, lengthen, Scale, extend, rotate, mirror, array etc with Civil Engineering Application	CAD commands	10
3.	Draw a line plan 2BHK residential building using absolute coordinate method. Use LIMITS, UNITS, LINE, ARC, CIRCLE, OFFSET, FILLET and other CAD commands.		10
4.	Draw dimensions on line plan prepared in practical No. 3.		06
5.	Drawing symbols of construction materials /components such as stone, brick, glass, partition, wall doors and windows.		06
6.	Prepare working and detailed drawing for any two items, such as foundation plan, plan of Stair such as straight, dog legged, open Newel.		06
7.	Draw a developed plan of Load Bearing structure 2BHK residential building using Draw and Modify commands. Use all above commands including POLYGON, ELLIPSE, COPY, MIRROR, ROTATE, CHAMFER commands.		06
8.	Draw a section of 2BHK residential building. of given plan of given plan of Practical no.7.		04
9.	Draw a elevation of 2BHK residential building of given plan of Practical no.7	Working drawing	04
10.	Plot/print the above drawings of given plan of Practical no.7 ,8 & 9		08
Total Hrs.			64

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	10	--	Journal & Printouts	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics, Practical Answer Sheets & Printout	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing diagrams of 2D of given line plan	20
2	Aesthetic of component part of building	20
3	Dimensioning figure	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	3	-	-	-	-	3	3	-	-
2	-	3	-	3	-	-	-	-	3	3	-	-
3	-	3	-	3	-	-	-	-	3	3	-	-
4	-	3	3	3	-	-	-	3	3	3	3	-
5	-	3	3	3	-	-	-	3	3	3	3	-
6	-	3	3	3	-	-	-	3	3	3	3	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	AUTOCAD-2000	David Frey, BPB Publication, New Delhi,	10 8176560804 13 9788176560801
2.	Introduction to Auto CAD 2012 for Civil Engineering Applications	Nighat Yasmin, SDC Publication, 2011	978-1-58503-642-4
3.	AutoCAD 2016: A Problem-Solving Approach, Basic and Intermediate	Shyam Tickoo, CAD/CIM Technologies, 22 nd Edition, August 2015	10: 1942689004 13: 978-1942689003
4.	Auto CAD 2010 Instructor	James Leach Tata McGraw Hill, 2007	0073375411 9780073375410
5.	Auto CAD and its Applications-Basics 2010	Terence M. Shumaker, David A. Madsen, David P. Madsen Goodheart- Willcox Publishers, 17 th Edition, 2010	10: 1590707605 13: 9781590707609

❖ **E-REFERENCES:**

- www.zwsoft.com/cad accessed on 15th October 2016,
- <https://www.scribd.com/doc/260678036/> accessed on 12th October 2016,
- medobute.pixnet.net/blog/post/123908069 accessed on 10th October 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Personal Computer's with latest version, TFT monitor 17 inches and Window based operating system with networking-
2. Printer
3. Software's: AUTOCAD

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R.N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. N.U. Sulbhewar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. S.R. Kukadapwar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Dr. S.J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr.M.R.Shelote	Consultant Engineer	M R Associates,Nagpur
6	Dr.R.N.Khapre	Associate Professor	Ramdeobaba College of Engineering and Management ,Nagpur.
7	Mr.A.J.Fulzele	Assistant Secretary(Tech.)	MSBTE,RO,Nagpur

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GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: CE412E ^s
COURSE TITLE	: INDUSTRIAL PROJECT (CIVIL)
PREREQUISITE	: 100 CREDITS
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK Hrs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: NIL

❖ RATIONALE:

Industrial project course is the manifestation of technical knowledge acquired by the student during their course of work. This course provides an opportunity to the students to identify and solve real life problem of the industries /research organization / society. Students also get opportunity to provide innovative, economic and technological viable solution to the world of work.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Select possible project work through market survey /Literature survey.
- 2 Select project and Develop method of commencement of project work.
- 3 Analyze feasibility using analysis tools
- 4 Perform project work in group
- 5 Prepare project report
- 6 Present project work, Demonstrate and justify the outcome of project work

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform introductory Task - Form project batch of four-five students - Select project as per area of interest - Select topic / industrial problem / work by consulting the guide from following list Projects based on the following areas - Environmental engineering - Transportation engineering - Water resources engineering - Advanced Survey - Construction management - Construction materials - Contracts, Accounts and valuation - Small scale industry related to civil engineering, - Construction technology - Remote sensing & GIS - Any other recent topic related to civil engineering Perform Literature Survey - Refer various Periodicals, Journals, Books, Internet literature related to project topic - Note down findings - Prepare database of collected literature on the basis of title, area of work, methodology used, type of work - Analyze industrial need - Prepare brief report	Introductory Task and Literature Survey	10
2	Plan project - Prepare Synopsis in standard format which includes following. Title Page: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Use Latex for preparing synopsis. - Submit the Synopsis to guide. - Approve synopsis from guide - Prepare action plan of project activities - Submit the action plan to guide. - Approve action plan from guide	Planning	10
3	Perform Project work Activities to be performed - Literature Survey - Survey/ testing	Project Work	15

	• Drawings • Computations • Result compilation • Conclusions • Report Writing		
4	Test Project work	Testing	15
5	Prepare project report in standard format, which includes following. • Title Page which includes: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name • Certificates: Student declaration, Certificate from guide • Acknowledgement • Table of contents • List of Tables • List of Figures • List of abbreviations and acronyms (if any) • Text 1. Introduction, objectives 2. Literature Survey 3. Methodology/Materials/Methods/Estimate. 4. Results 5. Summary/Conclusion. 6. References Use Latex for preparing report. Perform plagiarism check from free internet site. • Submit report of plagiarism check to the guide with project report	Project Writing	10
6	Present project work • Prepare power point presentation of work done. • Prepare yourself to handle examiner questions after presentation. • Practice group presentation. • Present before guide.	Presentation	4
		Total	64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics, Assessment Sheets & Project work done	1, 2, 3, 4,5,6
		Writing		Continuous	10	--	Project Report	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	100	40	Rubrics & Project Report and work done	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of Topic	10
2	Literature Survey	10
3	Project planning and implementation	10
4	Project work and Results and conclusions	20
5	Group Presentation of Work Done	10
6	Viva voce	40
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	–	3	–	–	3	3	–	3	–	–	–	–
2	–	3	3	–	3	3	3	3	–	–	3	–
3	–	3	3	3	3	3	3	3	–	–	3	3
4	–	3	3	3	–	–	3	3	3	3	3	3
5	–	3	–	3	–	–	–	3	3	3	3	3
6	–	–	–	–	–	–	3	3	3	3	3	3

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Models & Methods for Project Selection	Graves, Samuel B., Ringuest, Jeffrey L, International Series in Operations Research & Management Science Volume 58 2003	978-1-4615-0280-7
2	R and D Project Selection	Joseph P. Martino, Wiley series in Engineering and Technical Management	978-0471595373

❖ **E-REFERENCES:**

<http://www.che.iitb.ac.in/online/resources/academic-resources/technical-guides-and-tools/report-writing/guidelines-presentation-semin>, accessed on 4th November 2016

<http://www.jgsee.kmutt.ac.th/exell/General/PaperThesis.html>, accessed on 4th November, 2016

<http://www.engineeringcivil.com/how-to-write-a-project-report.html> , assessed on 28th October, 2016

<https://newton.ex.ac.uk/handbook/PHY/forms/WLB010919-4.pdf>, accessed on 4th November, 2016

<http://civil.final-year-projects.in/>, accessed on 4th November, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**
NIL❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. D. N. Kongre	Lecturer in Civil Engg.	Government Polytechnic, Nagpur.
3.	Mr. N. H. Telang	Lecturer in Civil Engg.	Government Polytechnic, Nagpur.
4.	Mr. M. R. Shelote	Consultant	M. R. Associates, Nagpur.
5.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
6.	Mr. A. J. Fulzele	Assistant Secretary (Technical)	MSBTE, Regional Office, Nagpur.
7.	Dr. S.W.Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
8.	Mr. G.V.Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME : PROFESSIONAL COURSES
COURSE CODE : AM406E^s
COURSE TITLE : INDUSTRIAL PROJECT (Structures)
PREREQUISITE : 100 Credits
TEACHING SCHEME : TH:00; TU:00;PR: 04(CLOCK Hrs.)
TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE : NIL
PR. TEE : 02 HRs (External)
PT. : NIL

❖ RATIONALE:

Industrial project course is the manifestation of technical knowledge acquired by the student during their course of work. This course provides an opportunity to the students to identify and solve real life problem of the industries /research organization / society. Students also get opportunity to provide innovative, economic and technological viable solution to the world of work.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Carryout market survey /Literature survey
- 2 Select project and Prepare planning
- 3 Perform project work in group
- 4 Test project work
- 5 Prepare project report
- 6 Present project work

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform introductory Task - Form project batch of four-five students - Select project as per area of interest - Select topic / industrial problem / work by consulting the guide from following list - Concrete design with different additives and combinations. - Testing and analysis of soil and soil properties in the laboratory. - Field testing of soil to assess bearing capacity of soil/ other relevant properties of soil. - Testing and analysis of building materials collected from different sources. - Non destructive testing of existing structures. - Analysis and design of building frames and structures using softwares. - Study of new building materials/ technological developments. Perform Literature Survey - Refer various Periodicals, Journals, Books, Internet literature related to project topic - Note down findings - Prepare database of collected literature on the basis of title, area of work, methodology used, type of work - Analyze industrial need - Prepare brief report	Introductory Task and Literature Survey	4
2	Plan project - Prepare Synopsis in standard format which includes following. Title Page: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Use Latex for preparing synopsis. - Submit the Synopsis to guide. - Approve synopsis from guide - Prepare action plan of project activities - Submit the action plan to guide. - Approve action plan from guide	Planning	8
3	Perform Project work - Review literature from library, internet, and industry visits. - Collect materials for testing/Collect	Project Work	12

	information and data for analysis & design. - Procure resources and organize laboratory set up for testing/ analysis & design. - Carry out testing/ analysis & design as per the standards & practice. - Prepare drawings/ interpret test results/ compare different materials based on test results. - Draw conclusion/ comment on findings. - Decide future scope of study.		
4	Test Project work	Testing	16
5	Prepare project report in standard format, which includes following. - Title Page which includes: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Certificates: Student declaration, Certificate from guide - Acknowledgement - Table of contents - List of Tables - List of Figures - List of abbreviations and acronyms (if any) - Text - Introduction, objectives - Literature Survey - Methodology/Materials/Methods/Estimate. - Results - Summary/Conclusion. - References Perform plagiarism check from free internet site. - Submit report of plagiarism check to the guide with project report	Project Writing	16
6	Present project work - Prepare power point presentation of work done. - Prepare yourself to handle examiner questions after presentation. - Practice group presentation. - Present before guide.	Presentation	8
		Total	64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics, Assessment Sheets & Project work done	1, 2, 3, 4,5,6
		Writing		Continuous	10	--	Project Report	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	100	40	Rubrics & Project Report and work done	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of topic	10
2	Literature survey	10
3	Project planning and implementation	10
4	Work done, Feasibility of work, Results	50
5	Report writing	10
6	Presentation of work and viva voce	10
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	2	-	-	2	-	3	3	2	3	-	-
2	-	-	-	-	2	3	-	3	2	3	-	-
3	-	2	3	3	2	3	3	3	-	-	-	3
4	-	2	3	3	-	3	3	3	-	-	-	3
5	-	-	-	-	-	-	3	3	-	3	-	3
6	-	-	-	3	-	-	-	3	2	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Advanced Concrete Technology	N.V.Nayak & A.K.Jain Narosa Publishing House Pvt. Ltd. - New Delhi, Edition-2012	10: 8184871864 13: 978-8184871869
2.	Advanced Reinforced Concrete Design	N.Krishna Raju, CBS; 2 edition, 1 December 2010	10: 8123912250 13: 978-8123912257
3.	Design of Steel Structures	S.S Bhavikatti, I.K.International Publishing House Pvt.Ltd, 2014	9789382332947
4	Advanced Soil Mechanics	Braja M Dass, CRC Press; 4 edition, 12 November 2013	10: 0415506654 13: 978-0415506656
5	Structural Analysis	T.S.Thadavamoorthy, Oxford, 6 September 2011	10: 0198069189 13: 978-0198069188

❖ **E-REFERENCES:**

- ❖ www.icjonline.com/ accessed on 6th September, 2016
- ❖ www.springer.com/engineering/civil+engineering/journal/40069 accessed on 6th September, 2016
- ❖ www.youtube.com/watch?v=vuZcPTp51Zk accessed on 6th September, 2016
- ❖ <https://www.nptel.ac.in> accessed on 5th September 2016
- ❖ <https://www.youtube.com/watch?v=I7vBA3s8-v0> assessed on 5th September 2016
- ❖ <https://www.youtube.com/watch?v=IfrzN7OsTzU> assessed on 5th September 2016
- ❖ <https://www.youtube.com/watch?v=sPyBgvvfIvc> assessed on 5th September 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Hot Air Oven
2. Slump Cone Apparatus
3. Compaction Factor Apparatus
4. Lab concrete mixture machine tilting type
5. Electronic weighing machine 100 Kg capacity
6. Concrete cube vibrating Table 1 m x 1m
7. Cube moulds 15x15x15cm
8. Accelerated curing tank.
9. Rebound Hammer
10. Compression Testing Machine

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Y.K. Chandarana	H.O.D, Applied Mechanics	Government Polytechnic, Nagpur.
2	H.L. Wahane	Lecturer Applied Mechanics	Government Polytechnic, Nagpur.
3	A.G. Bhaiswar	Lecturer Applied Mechanics	Government Polytechnic, Nagpur.
4	Mr M R Shelote	Consultant	M R Associates Nagpur
5	Dr R N Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur.
6	Mr A J Fulzele	Assistant Secretary(Tech)	MSBTE RO Nagpur
7	Dr. S.W. Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
8	Mr. G.V. Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX

LEVEL NAME : PROFESSIONAL COURSES

COURSE CODE : SE401E

COURSE TITLE : SEMINAR

PREREQUISITE : 60 Credits

TEACHING SCHEME: TH:00; TU:00;PR: 02(CLOCK Hrs.)

TOTAL CREDITS : 01(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : NIL

PR. TEE EXAM : 02 HRs (Internal)

PT. EXAM : NIL

❖ **RATIONALE:**

Seminar course is the manifestation of soft skills acquired by the student during their course of work. This course provides an opportunity to develop and present their own technical knowledge, communication skills, presentation skills, self-learning abilities, creativity, and team working abilities. This course will also enable them to gain confidence to face the world of work.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1 Select seminar topic
- 2 Carryout Literature survey
- 3 Prepare planning
- 4 Prepare seminar report
- 5 Prepare seminar presentation
- 6 Present interpersonal skills, presenting skills, soft skills and creativity.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform introductory Task - Select seminar topic individually as per area of interest - Select recent technical topic, not covered in curriculum, by consulting the guide.	Topic Selection	2
2	Perform Literature Survey - Refer various Periodicals, Journals, Books, Internet literature related to seminar topic - Note down findings - Prepare brief report	Literature Survey	6
3	Plan Seminar - Prepare outline of selected seminar topic in standard format - Approve seminar topic from guide - Prepare action plan of work - Submit the action plan to guide. - Approve action plan from guide	Planning	2
4	Prepare seminar report in standard format, which includes following. - Title Page which includes: Seminar Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Certificates: Student declaration, Certificate from guide - Acknowledgement - Text - Introduction - Literature Survey - Methodology/Materials/Methods - Results - Summary/Conclusion. - References Use Latex for preparing report. Perform plagiarism check from free internet site. - Submit report of plagiarism check to the guide with seminar report	Report Writing	12
5	Prepare power point presentation Prepare yourself to handle audience / examiner questions after presentation. Practice presentation before group of students	Preparation	08
6	Present before guide Present before assessment panel.	Presentation	02
Total Hrs.			32

- ❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Not Applicable
- ❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Not Applicable
- ❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics, Assessment Sheets & Seminar Report	1,2,3,4,5,6
		Report Writing		Continuous	10	--	Seminar Report	1,2,3,4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics, Seminar Report & Presentation	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of topic	05
2	Literature survey	05
3	Project planning and implementation, Work done, Feasibility of work	05
4	Report writing	05
5	Presentation Skills	25
6	Viva voce	05
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
1	–	3	–	–	–	–	–	3	3	–	–	–
2	–	3	3	3	–	–	3	3	3	3	–	–
3	–	3	3	3	–	–	3	3	3	3	–	–
4	–	3	3	3	–	–	3	3	3	3	–	–
5	–	3	3	3	–	–	3	3	3	3	–	–
6	–	–	–	–	–	–	–	3	3	3	–	–

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience	Carmin Gallo, McGraw-Hill Education, 1 st Edition, October 2009	10: 0071636080 13: 978-0071636087
2.	Speaking Your Mind: Oral Presentation and Seminar Skills	Rebecca Stott, Tory Young, Cordelia Bryan, Longman, 2001	0582382432, 9780582382435
3.	How to Design TED-Worthy Presentation Slides: Presentation Design Principles from the Best TED Talks	Akash Karia, Create Space Independent Publishing Platform, 3 rd Edition, February 2015	10: 1507638124 13: 978-1507638125
4.	Presenting with Credibility: Practical Tools and Techniques for Effective Presentations	Bruna Martinuzzi, Six Seconds Emotional Intelligence Press, Kindle Edition, April 2012	978-1-935667-12-4

❖ **E-REFERENCES:**

- http://www.prepareforsuccess.org.uk/skills_for_presenting_in_seminars.html , accessed on 5th November, 2016
- <http://www.che.iitb.ac.in/faculty/jb/courses/seminar/tips.html> , accessed on 5th November, 2016
- <https://www.youtube.com/watch?v=dEDcc0aCjaA> , accessed on 5th November, 2016
- <https://www.youtube.com/watch?v=V2q7Q2j7ESs> , accessed on 5th November, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. DLP Projector, latest specification
2. Computer, latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. W. Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
2.	Mr. G. V. Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: ID401E
COURSE TITLE	: INDUSTRIAL TRAINING
PREREQUISITE	: 70 Credits
TEACHING SCHEME:	TH: 00; TU: 00; PR: 02(CLOCK Hrs.)
TOTAL CREDITS	: 01(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT. EXAM	: NIL

❖ RATIONALE:

The aim of the polytechnic education is to create a pool of skill based manpower to support shop floor and field operations as a middle level link between technicians and engineers. Diploma pass out plays an important role in managing shop-floor operations. Therefore, it is necessary to the diploma pass out to get acquainted with the actual shop floor operations in the industry. This course has been designed to give actual working environment exposure to the diploma students.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Adhere industrial safety practices
- 2 Work in industrial working environment.
- 3 Carry out survey related to industrial processes.
- 4 Identify industrial problems for industrial Project Course
- 5 Prepare industrial training report based on work experience
- 6 Present report

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Adhere Industrial Safety Practices - Talk to safety officer - Record the safety practices to be followed in industry. - Record Don'ts and Do's. - Follow all instructions.	Safety Practices	04
2	Perform Industrial Process Survey - Collect information regarding various processes carried out in an industry by discussing the allotted supervisor/officer - Note down findings - Prepare brief report	Survey	06
3	Work in industrial working environment - Follow instructions of supervisor - Observe industrial processes - Record daily work done in diary	Working Experiences	18
4	Identify industrial problems - Discuss with the supervisor and workers - Identify the problem in any of the industrial process/system - Record your findings	Problem Identification	04
5	Prepare industrial training report in standard format, which includes following. - Title Page which includes: Title, Purpose of submission, Institute logo, Students Name, Industry Name, Department and Institute Name - Certificates: Student declaration, Certificate from industry - Acknowledgement - Text - Introduction to Industry - Safety Practices in Industry - Industrial Process - Working Experience - Results - Summary/Conclusion. - References Use Latex for preparing report. Perform plagiarism check from free internet site. - Submit report of plagiarism check to the allotted teacher with industrial training report	Report Writing	After Completion of Training
6	Prepare power point presentation Present before panel of teachers.	Presentation	
Total Hrs.			32

- ❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Not Applicable
- ❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Not Applicable
- ❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics, Assessment Sheets & Report	1,2,3,4,5,6
		Report Writing		Continuous	10	--	Report	1,2,3,4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics, Report & Presentation	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of industry/ industry supervisor's remark	05
2	Survey	05
3	Work done and Feasibility of work/ problem identified	15
4	Report writing	15
5	Presentation Skills	05
6	Viva voce	05
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	2	2	2	-	-	3	3	3	-	-
2	-	3	2	2	2	-	-	3	3	3	-	-
3	-	3	-	-	-	-	-	3	3	3	-	-
4	-	3	-	-	-	-	3	3	3	3	-	-
5	-	3	-	-	-	-	3	3	3	3	-	-
6	-	3	-	-	-	-	3	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Industrial Training and Education	Lokesh Choudhary, Mittal Publications, 2007	10: 8183242367 13: 9788183242363
2.	Training Practice	Penny Hackett, McGraw-Hill Education, September 2003	10: 0852929803 13: 9780852929803

❖ **E-REFERENCES:**

- <http://ihmshimla.org/wp-content/uploads/2013/05/Industrial-Training-Rule-Book.pdf>, assessed on 25th September, 2016

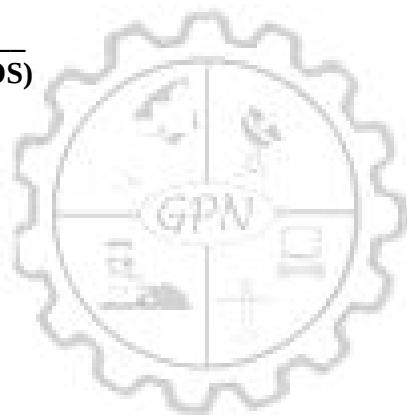
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- DLP Projector, latest specification
- Computer, latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. W. Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
2.	Mr. G. V. Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX

LEVEL NAME : PROFESSIONAL COURSES

COURSE CODE : ID402E

COURSE TITLE : INDUSTRIAL PRACTICES

PREREQUISITE : 70 Credits

TEACHING SCHEME : TH:00; TU:00;PR: 02(CLOCK Hrs.)

TOTAL CREDITS : 01(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : NIL

PR. TEE EXAM : 02 HRs (Internal)

PT. EXAM : NIL

❖ RATIONALE:

The aim of the polytechnic education is to create a pool of skill based manpower to support Construction site and field operations as a middle level link between technicians and engineers. Diploma pass out plays an important role in managing Construction site operations Therefore, it is necessary to the diploma pass out to get acquainted with the actual Construction site operations in the Construction industry. This course has been designed as an optional course to industrial training to give actual working environment exposure to the diploma students, through virtual industry in class room.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Visit industries.
- 2 Get acquainted with industrial safety practices through videos and industrial experts.
- 3 Carry out survey related to industrial processes.
- 4 Explore industrial working environment through videos and industrial experts.
- 5 Identify industrial problems for industrial Project Course discussing with industrial experts.
- 6 Prepare and present report based on virtual industrial exposure and industrial visit.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Visit any two industries related to program. Small scale, medium scale, large scale and perform task given in following point 2 to 5.	Industrial Visits	18
2	Get acquainted with industrial safety practices - Observe Video and listen industrial experts - Talk to industrial experts - Record the safety practices to be followed in industry. - Record Don'ts and Do's.	Safety Practices	02
3	Carryout survey related to industrial processes - Observe Video and listen industrial experts - Collect information by discussing with industrial experts - Note down findings - Prepare brief report	Survey	02
4	Explore industrial working environment - Observe Video and listen industrial experts - Observe industrial processes - Note down findings	Working Experiences	08
5	Identify industrial problems - Discuss with industrial experts - Identify the problem in any the industrial process/system - Record your findings	Problem Identification	02
6	Prepare and present report in standard format, which includes following. - Title Page which includes: Title, Purpose of submission, Institute logo, Students Name, Industry Names, Department and Institute Name - Certificates: Student declaration - Acknowledgement - Text - Introduction to Industry - Safety Practices in Industry - Industrial Process - Results - Summary/Conclusion. - References Use Latex for preparing report. Perform plagiarism check from free internet site. - Submit report of plagiarism check to the allotted teacher with industrial training report	Report Writing	Home Assignment
6	Prepare power point presentation Present before panel of teachers.	Presentation	
Total Hrs.			32

- ❖ SPECIFICATION TABLE FOR THEORY PAPER: NIL
- ❖ QUESTION PAPER PROFILE FOR THEORY PAPER: NIL
- ❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	40	--	Rubrics, Assessment Sheets & Report	1,2,3,4,5,6
		Report Writing		Continuous	10	--	Report	1,2,3,4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics, Report & Presentation	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of industry/ industry supervisor's remark	05
2	Survey	05
3	Work done and Feasibility of work/ problem identified	15
4	Report writing	15
5	Presentation Skills	05
6	Viva voce	05
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	2	2	2	-	-	3	3	3	-	-
2	-	3	2	2	2	-	-	3	3	3	-	-
3	-	3	-	-	-	-	-	3	3	3	-	-
4	-	3	-	-	-	-	3	3	3	3	-	-
5	-	3	-	-	-	-	3	3	3	3	-	-
6	-	3	-	-	-	-	3	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Industrial Training and Education	Lokesh Choudhary, Mittal Publications, 2007	10: 8183242367 13: 9788183242363
2.	Training Practice	Penny Hackett, McGraw-Hill Education, September 2003	10: 0852929803 13: 9780852929803

❖ **E-REFERENCES:**

- <http://ihmshimla.org/wp-content/uploads/2013/05/Industrial-Training-Rule-Book.pdf>, assessed on 25th September, 2016

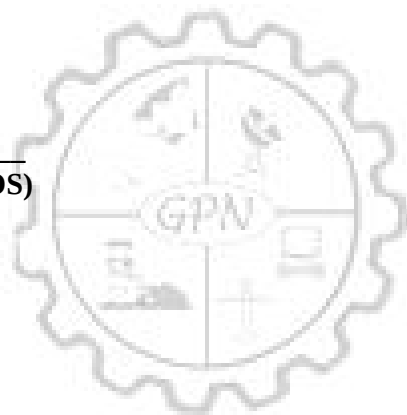
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- DLP Projector, latest specification
- Computer, latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. W. Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
2.	Mr. G. V. Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)

LEVEL - V

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: AM501E
COURSE TITLE	: ADVANCED STRUCTURAL ANALYSIS
PREREQUISITE	: AM401E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02CLOCK HRs.
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ **RATIONALE:**

The students having interest in structural engineering and perceive career in this field have a better option to choose this course. The course is intended to give knowledge and practice in analysis of structure with dynamic loads as well some advanced methods of analysis of structures. It also deals with the topics of strain energy at application level and matrix method which a structural engineer must know in today's era of computer application.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Analyze various important structures such as elastic arches, suspension bridges, and beams subjected to dynamic loads using advanced methods of analysis.
2. Apply matrix method to find forces in plane trusses and analyse beams.
3. Apply principles of strain energy to find deflection of beams.
4. Determine deflection and energy stored in simple beams by using principles of strain energy and other methods.
5. Draw influence line diagrams for beams subjected to rolling loads.
6. Use computer software for computing deflection in beams and frames by matrix methods.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Elastic Arches	1. Describe behaviour of three hinged arch subjected to loads. 2. State concept of normal thrust. 3. Draw influence lines for three hinged arch. 4. Interpret influence line diagrams.	1.1 Determination of normal thrust, shear force and bending moment for parabolic and segmental three hinged arches. 2.2 Influence lines for normal thrust, shear force and bending moment for three hinged parabolic arch.	10
2. Deflection of statically determinate beams and trusses.	1. State different theorems of analysis of elastic structures. 2. Describe theorems. 3. State applications of each theorem. 4. State and describe moment area method and Conjugate beam method. 5. Calculate deflection in beams by Moment area method and Conjugate beam method. 6. Calculate deflection in pin jointed trusses by Virtual work method.	2.1 Deflection of determinate beams by moment area method and Conjugate beam method. 2.2 Principle of virtual work method. Simple beam problems to find deflection of beams. 2.3 Deflection of determinate pin jointed trusses by of Virtual work method.	12
3.Strain Energy	1. Describe degree of static indeterminacy and it's application. 2. Describe different elastic theorems and it's applications. 3. Find deflection in beam and truss using Betti's and Maxwell's theorems.	3.1 Determination of degree of static indeterminacy for beams and frames. 3.2 Castiglano's theorem and its application 3.3 Betti's theorem and Maxwell's reciprocal theorems and it's application to simple beams.	10

4.Matrix methods	1. Describe various elements of matrix algebra. 2. State and explain principal superposition. 3. Differentiate between determinate and indeterminate structures. 4. Distinguish between flexibility method and stiffness method of analysis of structures. 5. Analyse plane trusses having single degree of redundancy using flexibility method. 6. Analyse propped cantilever, fixed beams, continuous beams using stiffness method.	4.1 Introduction to matrix method. 4.2 Elements of matrix algebra. 4.3 Application of matrix methods to plane trusses - Simple plane trusses with single span and single degree of redundancy only. 4.4 Application of matrix methods to propped cantilever, fixed beams and continuous beams with two spans subjected to concentrated loads and uniformly distributed loads only.	10
5.Influence lines for statically determinate beams	1. State concept of influence line and unit load. 2. Draw influence lines for beams and trusses. 3. Find shear force, bending moment and absolute bending moment for beams.	5.1 Influence lines for cantilever, simply supported beams, overhanging beams and pin jointed trusses. 5.2 Criteria for maximum shear force and bending moment under moving loads for simply supported beams. 5.3 Absolute maximum bending moment.	12
6.Cables and suspension bridges	1. Describe equilibrium and shape of loaded cord. 2. Find tension and horizontal reaction in the cable subjected to concentrated loads and uniformly distributed loads. 3. Draw shear force and bending moment diagram for three hinged stiffened girder subjected to concentrated loads over entire span and uniformly distributed loads.	6.1 Equilibrium of loaded cord and shape of loaded cord. Simple problems to find tension and horizontal reaction in the cord subjected to concentrated loads and uniformly distributed loads on entire span. Cord having supports at same level and supports at different levels. 6.2 Suspension bridge with three hinged stiffened girder. Problems to find bending moment and shear force in the girder subjected to concentrated loads and uniformly distributed loads over entire span only.	10
TOTAL			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Determine experimentally normal thrust in three hinged arch and draw shear force and bending moment diagram.	Elastic arches	04
2	Measure deflection of simply supported beam subjected to point loads.	Deflection of statically determinate beams and trusses	02
3	Measure deflection of cantilever beam subjected to point loads.		02
4	Measure deflection in beam and validate with Maxwell's reciprocal theorem.	Strain energy	04
5	Measure deflection in plane truss and validate with Betti's law of virtual work done.		04
6	Compute forces in various members of plane trusses by matrix method using computer softwares.	Matrix methods	04
	Compute bending and shear forces in fixed and continuous beams by matrix method using computer software.		04
7	Draw influence line diagram for simply supported and cantilever beams.	Influence lines for statically determinate structures	04
8	Compute tension in cable and bending moment and shear force in suspension bridges.	Cables and suspension bridges	02
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Elastic arches	00(00)	12(00)	00(06)	12(06)
02	Deflection of statically determinate beams and trusses	02(00)	08(00)	06(06)	16(06)
03	Strain energy	02(02)	04(04)	06(00)	12(06)
04	Matrix methods	02(02)	04(04)	00(04)	06(10)
05	Influence lines for statically determinate beams	02(00)	04(00)	06(06)	12(06)
06	Cables and suspension bridges	02(00)	06(04)	04(00)	12(04)
	Total	10(04)	38(12)	22(22)	70 (38)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	3	R	2	5/7
	4	R	2																
02	2	U	4	2	U	4	3	U	4	3	U	4	4	U	4				3/5
03	4	U	4	5	U	4	6	A	4	4	A	4	6	U	4				3/5
04	1	U	6	1	U	6	1	A	6										2/3
05	2	A	6	3	A	6	2	A	6										2/3
06	5	A	6	6	U	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing influence linediagram, operation of equipments. writing procedure etc.	20
2	Calculation, interpretation/conclusion of Result/observations, Drawing Graphs(if any)	10
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	3	-	-	-	-	-	-	-	-	-	-
4	-	-	2	2	-	-	-	-	-	-	-	-
5	-	-	2	2	-	-	1	1	1	-	-	-
6	-	-	2	2	-	-	-	-	-	-	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mechanics of structuresVol.-I	S. B. Junnarkar, H.J.Shah, Charotkar Publishers, 31 st Edition, 2014	9789380358994
2.	Mechanics of structuresVol.-II	S. B. Junnarkar, H.J.Shah,Charotkar Publishers, 24 th Edition, 2015	9789385039027
3.	Structural Analysis	DevdasMenon, Alpha Science International Ltd., Reprint, 2008	13-97818426543371 1842653377
4.	Structural Analysis Vol.-I	S.S.Bhavikatti, S. Chand (G/L) & Co., 2010	13-9788125942696 10-8125942696
5.	Basic Structural Analysis	C.S. Reddy, ,Tata McGraw Hill Publishing Co. Ltd., Third edition.	13-9780070702769 10-0070702764

❖ **E-RFERENCES:**

<https://youtu.be/ICDZ5uLGrI4> , assessed on 31st August, 2016

<https://youtu.be/WkgRo0noFpI>, assessed on 31st August, 2016

<https://youtu.be/JelnhPGvRgE>, assessed on 31st August, 2016

<https://youtu.be/swJULZs71Oo>, assessed on 31st August, 2016

<https://youtu.be/P3rcO1UMxYw>, assessed on 31st August, 2016

<https://youtu.be/-qms9xt3sbQ>, assessed on 31st August, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Model of three hinged arch.
2. Model of simply supported beam with point loads.
3. Model of cantilever beam with point loads.
4. Model of beams for Betti's and Maxwell's reciprocal theorem.
5. Computers and software to analyze plane trusses and beams by matrix methods.
6. Model of roof truss to find deflection..

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y.K. Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2	A.P.Waghmare	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
2.	H.L.Wahane	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
3.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
4.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
5.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM502E
COURSE TITLE	: FOUNDATION ENGINEERING
PREREQUISITE	: AM403E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02
TOTAL CREDITS	: 05(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

This course requires pre-requisite knowledge of the course 'Geotechnical engineering. Supervision of earthwork in the construction of dams, roads, embankments, pavements and foundation of other civil engineering structures is the important role of a technician. The basic knowledge of properties of soil and its behavior is therefore essential. All the structures transmit the loads through the foundations. Therefore the knowledge of foundation is utmost important and essential.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select appropriate type of foundation suitable for the structures.
2. Compute load carrying capacity of soil using available soil properties.
3. Apply suitable method of soil stabilization for prevailing site conditions.
4. Test soil for determining its engineering properties and parameters.
5. Carryout soil fields test.
6. Prepare report on field visit for testing purpose

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1.Introduction to foundations.	1. Define foundation and type of foundations. 2. List criteria for a good foundation. 3. State minimum depth of shallow foundation. 4. Calculate depth of foundation by different methods.	1.1 Definition and requirements of good foundation. 1.2 Type of foundations. 1.3 Minimum dimension of shallow foundations. 1.4 Determination of depth of foundation by soil exploration, open trial pit, boring.	08
2.Bearing capacity.	1. Describe different terms related to bearing capacity of shallow foundation. 2. State and illustrate Terzaghi's theory. 3. List different IS clauses of bearing capacity of soil as per IS6403. 4. Describe different methods to determine bearing capacity of soil. 5. Draw sketches of Plate load test and Standard penetration test apparatus. 6. Interpret test results.	2.1 Terminology of bearing capacity of shallow foundations 2.2 Terzaghi's theory 2.3 I. S. Code equation of bearing capacity. (I.S.6403) 2.4 Plate load test, Standard Penetration Test	12
3.Settlement of shallow foundations.	1. Describe settlement with reference to meaning, causes, effect and various components. 2. Interpret Terzaghi's theory of consolidation. 3. Describe different methods of settlement prevention. 4. Describe ground improvement with different methods.	3.1 Causes of settlement and its effect. Components of total settlement. 3.2 Terzaghi's theory of consolidation Settlement limitations as per IS: 1904 3.3 Methods of settlement prevention, concept of ground improvement. 3.4 Introduction to sand piles, preloading, compaction use of geotextiles.	12

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
4. Foundations in expansive soils.	1. State limitations of expansive soil for foundation. 2. Describe and draw different types of foundations used in expansive soil. 3. State different types of pile foundations with application. 4. Illustrate static analysis formula. 5. Select appropriate foundation.	4.1 Reasons for difficulties for foundation in expansive soil. 4.2 Types of foundation in expansive soil, strap, raft, combined and pile foundation. 4.3 Classification and uses of pile foundations. 4.4 Static analysis formula for pile foundation.	12
5. Stability of slopes.	1. List different methods to find stability of slopes. 2. Determine stability of slopes. 3. Illustrate slip circle analysis.	5.1 Different methods of determination of stability of slopes 5.2 Slip circle analysis	10
6. Soil stabilization and ground liquefaction.	1. State use of sand piles and micro piles. 2. Describe application of geosynthetics as soil stabilization. 3. Describe phenomenon of liquefaction. 4. List causes and methods to prevent liquefaction. 5. Select appropriate method of Soil stabilization.	6.1 Use of sand piles, micro piles. 6.2 Use of geosynthetics. 6.3 Introduction to phenomena of liquefaction. 6.4 Causes and ways to prevent liquefaction.	10
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform Standard Penetration test at identified location.	Bearing capacity	04
2	Perform California Bearing Ratio test on soil sample.		02
3	Perform Direct Shear test on soil sample.	Shear strength (Stability of slopes)	04
4	Perform Triaxial test on soil sample.		04
5	Perform Free swell index test on soil sample.	Foundations in expansive soil	02
6	Perform Swell Test on soil sample.		02
7	Prepare a report on following video recorded test on soil/ Expert lecture on any three tests from the following: 1. Soil exploration for foundation in expansive soil. 2. Pile foundation: suitability, erection methodology. 3. Plate load test. 4. Soil stabilization: Different methods, application in field.	Introduction to foundation, Foundations in expansive soil and Soil stabilization.	06
8	Prepare a report on the field test. Minimum two Field / Laboratory visits to assess and explore soil properties for bearing capacity, shear strength and appropriate method of soil stabilization.	All	06
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to foundations	02(00)	08(00)	00(04)	10(04)
02	Bearing capacity	02(02)	04(06)	06(00)	12(08)
03	Settlement of shallow foundations	02(00)	04(04)	06(04)	12(08)
04	Foundations in black cotton soil	02(00)	04(04)	06(04)	12(08)
05	Stability of slopes	02(00)	04(00)	06(06)	12(06)
06	Soil Stabilization	00(02)	08(04)	04(00)	12(06)
	Total	10(04)	32(18)	28 (18)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	2	R	2	5/7
	6	R	2																
02	1	U	4	1	U	4	2	U	4	1	A	4	3	U	4				3/5
03	2	U	4	3	U	4	4	U	4	3	A	4	4	U	4				3/5
04	5	U	4	6	U	4	6	U	4	6	U	4	4	A	4				3/5
05	2	A	6	3	A	6	2	U	6										2/3
06	4	A	6	5	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing diagrams	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	3	-	-	-	-	-
3	-	3	-	-	-	2	-	-	-	-	-	-
4	-	3	2	2	-	-	3	2	-	2	-	2
5	-	3	2	2	-	2	3	2	1	2	-	2
6	-	3	2	2	-	2	3	2	1	2	-	2

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

❖ **REFERENCE AND TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Foundation Engineering	B.J. Kasmalkar, Pittsburgh Vintage Grand Pix, 2008	9788185825458 8185825459
2	Foundation Engineering	P.C. Varghese, Publisher PHI Learning, Pvt. Ltd., 2005	8120326520 9788120326521
2.	Geotechnical Engineering: Principles and Practices of Soil Mechanics	V.N.S. Murthy, CRC Press, 2002	10: 0824708733 13: 978-0824708733
3.	Basic Soil Mechanics and Foundations	Alam Singh CBS Publisher, 2015	9788123901275
4.	IS: 2720 Method of Tests for Soils	Bureau of Indian Standards	-
5.	IS 1498 (1970): Classification and identification of soils for general engineering	Bureau of Indian Standards, 2007	-

	purposes [CED 43: Soil and Foundation Engineering]		
6	IS 1888 (1982): Method of load test on soils [CED 43: Soil and Foundation Engineering]	Bureau of Indian Standards, 2007	-

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=S-I0OSplaDA>, assessed on 19th September, 2016
- <https://www.youtube.com/watch?v=YElJCJUZ0hk>, assessed on 19th September, 2016
- <https://youtu.be/UsS9SXv9S78>, assessed on 19th September, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Load frame motorized, 2 speed with strain range 1.25mm to 1.50mm/min.
2. Unconfined compression tester proving ring type as per IS2720 (part 10).
3. Tri axial shear cells as per IS2720 (part 11 and 12) in 38mm and 50mm dia.
4. Direct shear test apparatus as per IS2720 (part 13), 2kn.
5. Compression testing machine 2000kn capacity, analog/digital type.
6. Laboratory CBR test apparatus motorized, 2 speed as per IS2720 (part 16).
7. Swell test apparatus with loading frame, proving ring, perforated swell plate etc.
8. Standard penetration test set as per IS2131, IS9640.

❖ **LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur
2.	S.S. Dikey	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur
3.	A.G. Bhaiswar	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur
4.	M. R. Shelote	Consultant	M. R. Associates, Nagpur
5.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
6.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AM503E
COURSE TITLE	: ADVANCED CONCRETE TECHNOLOGY
PREREQUISITE	: AM402E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02
TOTAL CREDITS	: 05(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

Concrete is the most widely used construction material in all types of civil engineering structures. Now a day's science and technology is changing rapidly. The technicians have to use knowledge of certain tests on ingredients of concrete to find properties for mix design. New techniques are developed in the field of concreting processes. They are required to supervise the modern concreting processes. Therefore knowledge of these processes will give upper hand to the technicians.

He should get acquainted with latest developments in the field of concrete technology, admixtures and chemicals used in concreting.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Choose the proper admixture for concrete.
2. Select appropriate concrete according to the nature of work and site conditions.
3. Choose appropriate concrete process for given condition.
4. Design quantities of materials for concrete mix proportion.
5. Test cubes prepared as per concrete mix proportion.
6. Prepare a visit report.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Concrete mix Proportioning.	1. Define mix proportioning. 2. Compare methods of mix proportioning 3. Choose type of mix for a given condition. 4. Calculate quantities of materials for a mix.	1.1 Introduction, factors affecting choice of mix proportion. 1.2 Methods of concrete mix design, trial and adjustment method, ACI method, rapid method, computer aided mix design. Comparison of methods. 1.3 Mix design of ordinary, standard and high strength concrete. Simple numerical problems based on it.	12
2. Concrete Admixtures.	1. Define admixture. 2. Choose proper admixture for a given condition. 3. State properties of admixtures. 4. State advantages & disadvantages of pozzolana concrete.	2.1 Definition of admixtures, functions of admixtures, IS classification, 2.2 Types of admixtures, accelerators, retarders, air entraining and water reducing. Plasticizers, super plasticizers, hyper plasticizers, special admixtures, uses of admixtures. 2.3 Physical properties of pozzolonic materials like fly ash, rice husk ash, Metakaolin, silica fume and natural pozzolona. 2.4 Ecological concept behind using fly ash, advantages & disadvantages of pozzolona concrete, properties of concrete influenced by pozzolona.	12
3. Special Concrete.	1. Describe properties of special concretes. 2. State advantages & disadvantages of special concretes. 3. State applications of special concrete. 4. Select a special concrete for given conditions. 5. Define ready mix concrete. 6. Draw plant layout for RMC. 7. State advantages & disadvantages of RMC.	3.1 Properties, ingredients required, advantages & disadvantages of- Light weight concrete, Lightweight aggregate concrete & foamed concrete, Autoclaved aerated concrete, No fines concrete, High strength concrete, Refractory concrete, High density & radiation shield concrete, Polymer concrete, Fibre reinforced concrete, self compacting and roller compacted concrete. 3.2 Applications of special concretes. 3.3 Definition of ready mixed concrete, types of plants, truck mixer efficiency, transit duration, effect of prolonged agitation, quality control acceptance and compliance.	12

		3.4 Applications, advantages and disadvantages of RMC.	
4. Precast Concrete	1. Define precast concrete. 2. Draw process diagram for a precast unit. 3. Draw plant layout for a precast unit. 4. State advantages & disadvantages of precast concrete.	4.1 Definition of precast concrete, process diagram showing manufacture of precast products, layout of plant for manufacture of precast products, review of small and large products. 4.2 Special formwork requirements, methods of compaction, curing and handling of components. 4.3 Application, advantages & disadvantages of precast concrete.	10
5. Prestressed Concrete	1. Define prestressed concrete. 2. State methods of prestressing concrete. 3. Calculate total stresses in prestressed concrete member. 4. State advantages & disadvantages of prestressed concrete.	5.1 Definition of pre-stressed concrete, concept of pre-stress, material requirement, methods of pre-stressing, losses in pre-stress, simple numericals. 5.2 Application, advantages & disadvantages of prestressed concrete.	10
6. Special Processes	1. Describe types of special processes. 2. Choose type of special process for a given condition.	6.1 Sprayed concrete. 6.2 Underwater concreting. 6.3 Grouting. 6.4 Slip-form construction. 6.5 Pumping concrete. 6.6 Vacuum concrete process. 6.7 Concrete coating and surface treatments.	08
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Mix design of at least TWO grades of concrete by TWO different methods	Concrete mix Proportioning	10
2	Strength comparison of fly ash concrete & normal concrete for different proportion of fly ash. (at least TWO).	Concrete Admixtures.	10
3	Report on minimum TWO visits to 1) Ready mix concrete plant. 2) Special concreting operations. 3) Precast concrete unit.	Special Concrete and Precast Concrete	10
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Concrete mix Proportioning	02(00)	04(00)	06(00)	12(00)
02	Concrete Admixtures.	02(00)	08(04)	06(00)	16(04)
03	Special Concrete.	02(00)	08(04)	00(06)	10(10)
04	Precast Concrete	02(00)	04(04)	06(00)	12(04)
05	Prestressed Concrete	02(00)	08(04)	06(00)	16(04)
06	Special Processes	00(04)	04(08)	00(06)	04(18)
	Total	10(04)	36(24)	24 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	5/7
	6	R	2																
02	1	U	4	2	U	4	2	U	4	2	U	4	3	A	4				3/5
03	3	U	4	3	U	4	4	U	4	4	U	4	5	U	4				3/5
04	5	U	4	5	U	4	6	U	4	6	U	4	6	U	4				3/5
05	1	A	6	2	A	6	3	A	6										2/3
06	4	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	20
2	Writing procedure, Calculation, Result, Drawing Graphs(if any)	20
3	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	3	-	-	-	-	-	-
2	-	3	-	-	-	3	-	-	-	-	-	-
3	-	3	-	-	-	3	-	-	-	-	-	-
4	-	3	-	-	1	-	1	2	2	-	-	1
5	-	3	1	1	-	-	1	2	2	-	-	1
6	-	3	-	-	-	-	-	2	2	1	1	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Concrete Technology	M. L. Gambhir, Tata Mc Graw Hill, Fifth Edition, 2013	13:978-1-25-906255-1 10:1-25-906255-4
2	Concrete Technology	M. S. Shetty, S.Chand and Co, First Edition, 2005	13: 978-8121900034 10: 8121900034
3	Concrete Technology	S.Bhavikatti,I K International Publishing House Pvt. Ltd, First Edition, 2015	13: 978-9384588670 10: 9384588679
4	Concrete Technology	A.M.Neville, J.J.Brooks, Pearson Education, First Edition, 2002	13: 978-8131705360 10: 8131705366
5	Concrete Technology	A.R.Santhakumar, Oxford University Press, First Edition, 2006	13: 978-0195671537 10: 0195671538
6	I.S: 383 – 1970 Specification for coarse and fine aggregates from Natural sources for concrete.	Bureau of .Indian .Standards.	--
7	I.S: 456 – 2000 Code of practice for plain	Bureau of .Indian .Standards	--

	and reinforced concrete (fourth revision)		
8	I.S: 516 – 1959 Methods of tests for strength of concrete (xii reprint December 1987)	Bureau of .Indian .Standards	--
9	I.S.: 8112- 1989 Specification for 43 grade OPC	Bureau of .Indian .Standards	--
10	I.S: 12269 - 1987 (reaffirmed 1999) Specification for 53 grade O.P.C.	Bureau of .Indian .Standards	--
11	I.S. : 10262 – 1982 Recommended guidelines for concrete mix Design	Bureau of .Indian .Standards	--
12	I.S. 13311 (part-1 and 2) – 1992 Methods of non-destructive testing of concrete part-1 ultrasonic pulse velocity. part-2 rebound hammer.	Bureau of .Indian .Standards	--

❖ E-REFERENCES:

- <https://www.nptel.ac.in> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=I7vBA3s8-v0> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=lfrzN7OsTzU> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=sPyBgvvfIvc> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=jenYP9Acivg> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=WWm5S2L-VCI> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=0z6gjjrSn0M> assessed on 05th September 2016
- <https://www.youtube.com/watch?v=EFBSV5y-fEg> assessed on 05th September 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Vicat Apparatus & Set Of Needles, 01
2. Compression Testing Machine 200T capacity. 01
3. Set Of Sieves & Shaker 01
4. Hot Air Oven 01
5. Pycnometer 03
6. Slump Cone Apparatus 01
7. Compaction Factor Apparatus 01
8. Lab concrete mixture machine tilting type 01
9. Electronic weighing machine 100 Kg capacity 01
10. Constant Temperature Water Bath 01
11. Concrete cube vibrating Table 1 m x 1m 01
12. Aggregate Impact Testing Machine 01
13. Los-Angeles Abrasion Testing Machine 01

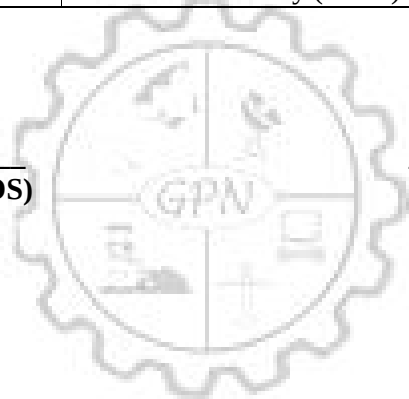
14. Crushing Value Apparatus	01
15. Needle Vibrator	01
16. Cube moulds 15x15x15cm	06
17. Cube moulds 7.07x7.07x7.07cm	06
18. Mortar cube vibrating machine.	01
19. Accelerated curing tank.	01

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K.Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	S. S. Dikey	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
4.	A. G. Bhaiswar	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
5.	M. R. Shelote	Cnsultant	M. R. Associates, Nagpur
6.	Dr. R. N. Khapre	Associate Professor	RCOE, Nagpur
7.	A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE501E
COURSE TITLE	: ADVANCED CONSTRUCTION EQUIPMENTS
PREREQUISITE	: CE402E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT	: 01 HR

❖ **RATIONALE:**

Civil Engineering is mainly concerned with construction and maintenance of various types of structures. In today's world, the work project is required to be completed in stipulated time period with required quality. If the construction is carried out with traditional method and equipment's, it may lead to delay in time, which may increase the cost of construction project. In view of speedy construction activities, it is essential to use modern civil engineering equipment's. Thus civil engineering technicians should be thoroughly familiar with the working, application and maintenance of the wide range of modern civil engineering equipment's.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify various construction equipment in civil engineering project
2. Describe working principle of various construction equipments.
3. Justify the need of suitable equipment as per requirement of job.
4. Draw the line sketches of different construction equipments.
5. Draft a report informing important features of Construction equipment.
6. Demonstrate the function of various components of Construction equipment at site.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Earth Moving Machinery	1. Enlist various types of excavating equipment's 2. State General consideration in Excavation 3. Enumerate Factors affecting Choice of Equipment 4. Describe working of Power Shovel/Dragline 5. Describe working of various types of rollers 6. Draw line diagram of various earth moving machinery 7. Justify the use of earth moving and compaction equipment's in earthen dam construction.	1.1 Excavation Equipment's General consideration in Excavation, Factors affecting Choice of Equipment Different types of Excavating Equipment's. Power Shovel, JCB, Dragline, Bull Dozer, Scraper, Clam-shell. 1.2 Compaction Equipment's Need of compaction machinery. Various types of compaction machinery. Use and working of Smooth wheeled roller, Sheep foot roller, Vibratory and Pneumatic rollers.	12
2. Hoisting and Conveying Machinery	1. Name various types of Hoisting equipment's used on construction site 2. List various types of Conveying equipment's used on construction site 3. State Principle and working of various types of cranes in civil engineering 4. Draw line diagram of various types of cranes 5. Describe working of Belt conveyors 6. State uses of dumpers, tractors and trucks. 7. Justify the use of crane in construction of skyscraper.	2.1 Hoisting Equipment's Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes, Derricks 2.2 Conveying Equipment's Working of Belt conveyors. Types of belts and conveying mechanism. Capacity and uses of dumpers, tractors and trucks.	10

3. Concreting Equipment's	1 List various types of Concrete mixers used on construction site 2 Construct lay out of Ready mix concrete plant 3 Illustrate process of Tremix concreting 4 State Principle and working of various types of Vibrators used in concreting 5 Describe working of Jaw crusher/ Hammer mill 6 Name the types of stone crusher with their capacities 7. Justify the use of mixing equipment for mass housing project.	3.1 Stone Crushers Types of stone crushers, capacities and working. Various type of crushing machineries- Jaw crusher, Hammer mill, Gyratory crusher, Cone crusher, Roll crusher. 3.2 Concrete Mixers Types of concrete mixers. Weigh batching equipment's, Equipment's for transportation of concrete – trollies, lifts, transit mixer, concrete pumps. Layout and working of Ready mix concrete plant. Equipment's used in Tremix concreting. 3.3 Concrete Vibrator Principle and working of various types of concrete vibrator- Needle vibrator, Shutter vibrator, Screed vibrator, Table vibrator.	14
4. Pumping and Dewatering Machinery	1 Enlist the Factors affecting most economical type of Pumping arrangements 2 Explain various methods of dewatering 3 Draw a neat sketch of various types of pumps 4 State the use of various types of pumps 5 State the criterion for selection of pump on site 6 Justify the use of pump for rapid lowering of water level in foundation.	4.1 Application of Pumping. Factors affecting most economical type of Pumping arrangements 4.2 Methods of Dewatering – well point system, bored well system. 4.3 Different types of Water Supply & Dewatering equipment- Centrifugal pump, Reciprocating pump, Multistage pump, Submersible pump. 4.4 Sketches with labeling of various parts, Working principles & Uses of above types of equipment's	08
5. Drilling and Pile Driving Machinery	1 Enlist various types of drilling equipment's used on construction site 2 State the use of jackhammer/ drifter 3 Enumerate the importance of bit in drilling work. List its types 4 Distinguish between Drop hammer and Diesel hammer 5 Describe Pile driving process using Drop hammer/ Diesel hammer 6. Justify the use of pile driving equipment in waterlogged land.	5.1. Drilling equipment's: Purpose of drilling, Various types of Drilling machinery: Percussion Drill, Rotary drill, Hydraulic drill. Working principles & Uses of Jack hammers, Drifters, shot drill, Diamond drill. Drill bits – types and uses 5.2 Pile Driving equipment's: Meaning & process of Pile Driving. Various types of Pile Driving Machinery: Drop hammer, Diesel Hammer. Working principles & Uses of above types of equipment's	08
6. Miscellaneous equipment's and Equipment	1 Draw a layout of hot mix bitumen plant 2 Describe working of Concrete Paving	6.1 Miscellaneous equipment's Working of hot mix bitumen plant, Bitumen paver. Working principles & Uses of Concrete	12

Management	machines. 3 Name the equipment's used in pre-stressing. 4 State owning cost and operating cost of construction equipment 5 State economic life of construction equipment 6 Describe break down maintenance of equipment's. 7 Calculate the owning and operation cost of equipment from given data.	Paving machines. Grouting equipment's, Floor polishing machine Equipment's used in pre-stressing. 6.2 Equipment Management Standard equipment, Special equipment, Selection of equipment. Owning and operation cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of equipment's.	
Total Hrs.			64



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare a report containing line sketch, process, working principles, suitability of Excavation and Earth moving machinery.	Earth Moving Machinery	04
2	Prepare a report containing line sketch, process, working principles, and suitability of various Compaction machineries.	Earth Moving Machinery	04
3	Prepare a report containing line sketch, process, working principles and suitability of various Hoisting machineries.	Hoisting and Conveying Machinery	02
4	Prepare a report containing line sketch, process, working principles and suitability of different Conveying machineries.	Hoisting and Conveying Machinery	02
5	Prepare a report containing line sketch, process, working principles and suitability of various Mixing machineries.	Concreting Equipment's	04
6	Prepare a report containing line sketch, process, working principles and suitability of various Crushing machineries.	Concreting Equipment's	04
7	Prepare a report containing line sketch, process, working principles, and suitability, of various Pumping and Dewatering Machineries.	Pumping and Dewatering Machinery	04
8	Prepare a report containing line sketch, process, working principles, and suitability, of various Drilling and Pile Driving Machineries.	Drilling and Pile Driving Machinery	02
9	Prepare a detailed visit report of Ready Mix Concrete plant (RMC) or Bitumen hot mix plant	Concreting Equipment's Miscellaneous equipment's and Equipment Management	02
10	Prepare a detailed report of visit to construction site either of High rise building, Road or any other civil engineering project using advanced construction equipment's.	All units	02
Skill Assessment			02
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Earth Moving Machinery	02(00)	06(04)	04(04)	12(08)
02	Hoisting and Conveying Machinery	02(00)	06(04)	04(00)	12(04)
03	Concreting Equipment's	02(04)	10(00)	04(04)	16(08)
04	Pumping and Dewatering Machinery	02(00)	08(00)	00(06)	10(06)
05	Drilling and Pile Driving Machinery	00(02)	04(06)	04(00)	08(08)
06	Miscellaneous equipment's and Equipment Management	02(02)	06(04)	04(00)	12(06)
	Total 70	10(08)	40(18)	20(14)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	6	R	2	5	R	2	5/7
	6	R	2																
02	1	U	4	2	A	4	3	U	4	1	A	4	2	U	4				3/5
03	3	A	4	4	U	4	5	U	4	1	A	4	3	A	4				3/5
04	4	U	4	5	A	4	6	A	4	5	R	4	6	U	4				3/5
05	1	U	6	2	U	6	4	A	6										2/3
06	3	U	6	6	U	6	5	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of relevant Equipment	10
2	Drawing of line sketch	10
3	Description of process	10
4	Viva-voce	20
	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	2	-	-	-	3	-	-
2	-	-	-	-	2	-	-	-	-	-	-	-
3	-	3	-	-	2	2	-	-	-	3	-	-
4	-	3	-	-	-	-	-	3	3	3	-	-
5	-	-	-	-	-	-	-	3	3	3	-	-
6	-		1	-	-	-	-	3	3	3	-	1

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Construction Planning Equipment, and Methods	Peurifoy, Schexnayder, Shapira. Tata McGraw-Hill Edition, 2010	13: 978-0-07-070699-6 10: 0-07-070699-9
2.	Construction Equipment and Its Management	S. C. Sharma, Khanna Publisher, 2013	10: 8174092285 13: 9788174092285
3.	Construction Equipment and Its Planning Application	Dr.MaheshVarma, Melropotam Book Co.(P) Ltd., 4 th Edition, 2014,	--
4.	Construction Equipment and Job Planning	S.V.Deodhar, Jain Book Agency, 4 th Edition, Reprint 2014,	8174091149

❖ **E-REFERENCES:**

- www.engineeringcivil.com/theory/construction-equipments , accessed on 4th September, 2016
- www.sanyglobal.com/product/equipments accessed on 4th September, 2016
- <http://theconstructor.org/construction/equipment/construction-equipments-for-different-purposes/901/> accessed 4th September, 2016
- <http://www.uceindia.com/https://www.youtube.com/watch?v=ubrbizILJk>
Apr 10, 2016 - Uploaded by Carl Jennings accessed on 4th September, 2016
- <https://www.youtube.com/watch?v=ApmPxKGEX6E> Oct 22, 2015 - Uploaded by Heavy Construction Machinery accessed on 4th September, 2016
- <http://www.slideshare.net/abhijitpawar9406/construction-book> accessed 4th September, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION****Working Models of**

1. Earth Moving Machinery
2. Hoisting and Conveying Machinery
3. Concreting Equipment's
4. Pumping and Dewatering Machinery
5. Drilling and Pile Driving Machinery
6. Crusher

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Lecturer in civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. M.R. Shelote	Consultant Engineer	M R Associates, Nagpur
4.	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
5.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE502E
COURSE TITLE	: MAINTENANCE OF STRUCTURES
PREREQUISITE	: CE402E
TEACHING SCHEME:	TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05(1 TH/TUCREDIT = 1CLOCK HR; 2 PR CREDIT=1 CLOCK HR)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT	: 01 HRs

❖ **RATIONALE:**

The knowledge and skill of repairs, maintenance and rehabilitation is a basic requirement of Civil Engineer. This course will enable the students to choose appropriate method and technique for repairs of structures. Repairs, maintenance and rehabilitation of civil engineering structures are must for improvement of strength and durability of structure, thus extending a life of the structure. This course will help to lead the students to work as professionals / entrepreneur in repairs, maintenance and rehabilitation.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Analyze various types of failures in Civil Engineering structure.
2. Identify causes of failures of the various structures.
3. Suggest Repairs of any Civil Engineering structure..
4. Select different materials for repairs of defects.
5. Identify defects and damages in building for rehabilitation
6. Choose appropriate method and techniques for repairs maintenance and rehabilitation of Civil Engineering structure.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction	1. Define repairs, maintenance and rehabilitation. 2.State necessity of repairs Maintenance and rehabilitation 3.Classify different types of repairs , maintenance and rehabilitation	1.1 Technical Term: repairs , maintenance and rehabilitation 1.2 Necessity :Repairs , Maintenance and Rehabilitation 1.3 Types : Repairs , Maintenance and Rehabilitation	08
2. Inspection Identification and Diagnosis	1. Identify the common defects and failures. 2. Identify the various Material used for different repairs.	2.1 Common defects and failures with possible causes in Building, Roads, Bridges, Water supply and Sewerage scheme, canal and Cross Drainage (CD) works. 2.2 Material used for different repairs Epoxy resin, Epoxy mortar, polypropylene, poly-sulphate, silicon, gypsum cement mortar, polymer concrete, fiber reinforce concrete. etc	10
3. Causes of defects /damages in Civil Engg. structure	1. State the different damages. 2. Describe causes of different damages. 3. Suggest remedial measures for damages.	3.1 Causes of different Damages due to – i)Earthquake ii)Fire iii) Flood iv) Crack in plaster v) brickwork vi) concrete vii) Corrosion and viii) Advance damages.	10
4. Techniques for Repairs	1. State the types of repair technique. 2. Describe physical examination of common defects/ damages. 3. Apply the different techniques for repairs.	4.1 .Types of technique adopted 4.2 Physical examination of common defects/ Damages. 4.3 Structural and non structural repairs- i) Gunnting , grouting and shotcreting ii) Methods of corrosion protection iii) Mortar repairs crack iv) Shoring and underpinning etc	12

5. Repairs and Maintenance of Civil Engg. Items of Work	1. Identify failures in structure 2. Describe different process of repairs and maintenance of various components of building. 3. Suggest the suitable process of maintenance	5.1 Foundation – Types, remedies process of foundation and examination of existing foundation. 5.2 Masonry walls works – crack in walls, causes of cracks, dampness in walls, and causes, prevention of cracks. 5.3 Plastering works – cracks in plaster, causes of cracks and prevention of cracks. 5.4 Flooring works – types of floors, sinking of floors, techniques adopted to restrict sinking etc 5.5 RCC works – concrete properties, effect due to climate, temperature, chemicals etc and remedies of RCC works. 5.6 Roads – Bitumen road and Concrete road	14
6. Strengthening Methods	1. Define the terms related to Strengthening 2. Describes the C 3. Suggest methods for Strengthening	6.1 Define Strengthening 6.2 Strengthening Methods of Cantilever, beam, slabs, walls, columns, foundation 6.3 Suggestions for Strengthening of above	10
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Identify various defects damages occur in Civil Engineering structure and prepare visit report and suggest remedial methods.	Inspection Identification and Diagnosis Causes of Defects /Damages in Civil Engineering structure.	08
02	Perform market survey of various materials used in of Civil Engineering structures and prepare visit report including specification cost .	Inspection Identification and Diagnosis	08
03	Perform case study on any Civil Engineering Structure and Prepare report on it	All Units	14
Skill Assessment			02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	4(02)	04(0)	00(00)	08(02)
02	Inspection Identification and Diagnosis	04(00)	08(08)	00(00)	12(08)
03	Causes of Defects /Damages in Civil Engg. structure.	04(02)	04(00)	04(04)	12(06)
04	Techniques for Repairs	02(04)	06(00)	04(06)	12(10)
05	Repairs and Maintenance of Civil Engg. Items of	04(00)	08(08)	04(00)	16(08)
06	Strengthening Methods	02(02)	04(04)	04(00)	10(06)
	Total	18(08)	34(20)	18 (12)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	4	R	2	6	R	2	4	U	2	4	A	2	1	R	2	3	R	2	5/7
	6	R	2																
02	1	R	4	2	R	4	3	R	4	5	R	4	1	U	4				3/5
03	3	U	4	4	U	4	5	U	4	5	U	4	6	U	4				3/5
04	3	A	4	4	A	4	5	A	4	6	A	4	4	R	4				3/5
05	2	U	4	2	U	4	5	U	4	5	U	4	6	U	4				2/3
06	3	A	4	4	A	4	2	U	4	2	U	4							2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION**

S No.	Description	Max Marks
1.	Selection of materials	10
2	Identification of Defects	10
3	Remedial Measures	10
4	Viva -voce	20
	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	2	-	-	-		3	-
2	-	3	-	-	-	2	-	-	-	3		-
3	-	3	-	-	-	2	-	-	-			-
4	-	3	2	-	2	2	-	2	2	3	3	-
5	-	3	2	-	2	2	-	2	2	3		-
6	-	3	2	-	2	2	-	2	2		2	-

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

❖ **REFERENCE and TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Maintenance and Repairs of Building	P.K. Guha. New Central Book Agency,	10: 8173813558 13 : 978-8173819559
2.	Maintenance Engineering for Civil Engineering	C. S. Nayak, Standard Publisher	
3.	Building Construction	Sushil Kumar, Standard publications	10: 8180141683 13:978-8180141683
4.	Theory and Practices of concrete Technology	M.S. Shetty, S Chand and Co. New Delhi.	10: 8121903483 13: 978-8121903486
5	Building Maintenance	Ivor H. Seeley, Redwood Burn Ltd , ThrowbridgeandEsher	10: 0333171608 13: 978-0333171608

❖ **E-REFERENCES:**

- http://www.unesco.org/education/pdf/7_30.pdf , assessed on 24th October, 2016
- <http://www.iitk.ac.in/nicee/wcee/article/0153.pdf> , assessed on 24th October, 2016
- <http://cpwd.gov.in/Publication/CPWDmaintainencemanual.pdf> , assessed on 24th October, 2016

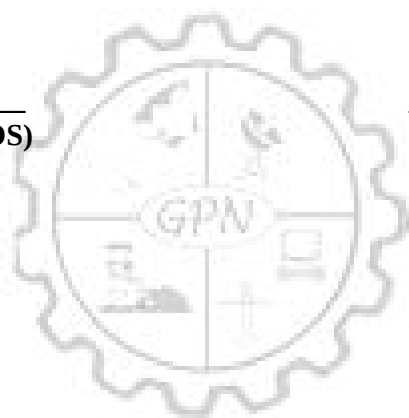
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**
NIL

❖ **LIST OF EXPERTS and TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr. R. N. Giradkar	HOD Civil Engg. Dept	G. P. Nagpur
2	Mr. S. S. Mude	Lecturer in Civil Engg.	G. P. Nagpur
3	Dr. S. J. Nikam	Lecturer in Civil Engg.	G. P. Nagpur
4	Mr. S. R. Kukdpwar	Lecturer in Civil Engg.	G. P. Nagpur
5	Mr. M. R. Shelote	Consultant	M R Associates, Nagpur
6	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management ,Nagpur
7	Mr. A. J. Fulzele	Assistant Secretary (Tech)	MSBTE, RO, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE503E
COURSE TITLE	: LOW COST HOUSING
PREREQUISITE	: CE402E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05(1 TH/TU CLOCK HR= 1 CREDIT, 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs(Internal)
PT	: 01 HR

❖ RATIONALE:

Shelter is the basic need of human being and closely associated with socio-economic development of every individual. In India, large number of population living in old or dilapidated houses in both urban and rural areas, similarly many families having no shelter are forced to spend their life on road side or under open sky or otherwise in unhygienic condition. The immediate solution for such housing condition is to plan low cost houses and construct them on mass scale with such design, technique and specifications that these will be within reach of intending buyer.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the need of low cost housing
2. Describe the low cost techniques in mass housing.
3. Choose appropriate construction material for low cost houses.
4. Draw the layout for low cost housing project
5. Prepare estimate for low cost housing scheme.
6. Use appropriate low cost material & technique in designing housing scheme.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Housing Situation in India	1. Enlist various types of housing schemes as per economic status. 2. Discuss the present housing condition in India. 3. Enumerate Factors causing shortage of houses in India. 4. Describe Prime minister aawas yojna. 5. Write the contribution of MHADA in mass low cost housing schemes.	1.1 Definition of Housing 1.2 Classification of housing as per economic status i.e. HIG, MIG, LIG, EWS etc. 1.3 Housing shortage in urban and rural area. 1.4 Study of present housing condition w.r.t. structural condition, overcrowding, sanitary facility, density etc. 1.5 Different Government schemes for propagating low cost mass housing 1.6 Different government, semi-government, private organization involved in low cost housing	12
2. Need of Low Cost Housing	1. Name various factors causing necessity of low cost housing. 2. Draw a pie chart showing various expenses incurred in construction of house.	2.1 Factors causing necessity of low cost housing viz. 2.2 Poverty in India, Rapid increase in slums, Resources availability, Urban land values, Cost of construction, Cost of material, Expenses on labour etc.	06
3. Building Materials for Low Cost Houses	1. List various organic and non-organic traditional building material used for low cost housing. 2. Illustrate process of using rice husk as construction material 3. Describe, how industrial waste is used as construction material? 4. Enlist various new materials used in low cost housing.	3.1 Traditional Building Materials- 3.1.1 Study of different organic and non-organic traditional building material used for low cost housing. 3.1.2 Modification in the properties of traditional building materials for low cost housing. 3.2 Agro-Industrial Waste Materials- 3.2.1 Study of Agro-Industrial Waste i.e. fly ash, rice husk, lime sludge, phosphorus- gypsum etc. 3.2.2 Use of Agro-Industrial Waste in construction of low cost houses. 3.3 New Construction Materials-Fly ash concrete block, Foam concrete panel,	14
4. Planning Consideration for Low Cost Housing	1. Enlist the Factors affecting the planning of low cost houses. 2. Describe various planning standards adopted by CBRI for low cost houses. 3. Draw a plan for EWS family in Nagpur city. 4. Compare Planning standards adopted by NIT and MHADA.	4.1 Study of planning standards for low cost housing to achieve economy such as plot area, height, shape, ventilation, grouping of houses etc. 4.2 Study of planning consideration given by different planning agencies, C.B.R.I. and various state housing boards for low cost houses	10
5. Low Cost Construction Techniques	1. State the necessity of changes in construction technique for low cost houses.	5.1 Necessity of changes in construction technique for low cost houses. 5.2 Study of new construction techniques	12

	2. Describe Reinforced brick panel system. 3. Draw a plan and elevation of Rat-trap bond. 4. Distinguish between foundation proposed by CBRI and conventional foundation.	i.e. Reinforced Brick panel system, Channel unit, L-panel, RCC planks, thin RCC slab, Precast joist, Ferro cement products, Rat-trap bond, Low cost foundation propagated by CBRI. 5.3 Study of reduction in cost due to new techniques compared to traditional methods.	
6 Low Cost Sanitation	1.State advantages of low cost sanitation, 2. Describe salient features of sulabhsauchalaya with neat sketch. 3. Draw a neat sketch of rural sanitation scheme. 4. State importance of Swachha Bharat Abhiyan.	6.1Need of low cost sanitation 6.2 Advantages of low cost sanitation., 6.3 Study of different types of low cost sanitary facilities such as C.B.R.I. type, sulabh sauchalaya. 6.4 Different Government schemes for propagating low cost sanitation.	10
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Collect information about at least two new low cost construction materials from market / industry / literature and prepare a report.	3.Building Materials for Low Cost Houses	04
2.	Collect information about at least two new low cost construction techniques from market / industry / literature and prepare a report.	5. Low Cost Construction Techniques	04
3.	Draft a report on visit to two Low Cost Housing scheme.	4.Planning Consideration for Low Cost Housing 5.Low Cost Construction Techniques	08
4.	Prepare a Group Project (batch of 10 students) which includes- - Planning of low cost housing scheme - Preparation of theoretical model of housing scheme by using low cost materials and techniques - Estimation of model - Preparation of drawing(at least two drawing sheets of A1 size) - Report writing	All units	14
Skill Assessment			02
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Housing Situation in India	02(00)	08(06)	00(00)	10(06)
02	Need of Low Cost Housing	02(00)	06(04)	00(00)	08(04)
03	Building Materials for Low Cost Houses	02(00)	14(08)	00(00)	16(08)
04	Planning Consideration for Low Cost Housing	02(00)	04(00)	10(00)	10(06)
05	Low Cost Construction Techniques	00(04)	12(10)	00(04)	18(12)
06	Low Cost Sanitation	02(00)	06(04)	00(00)	08(04)
	Total	10(04)	50(32)	10 (04)	70 (40)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	6	R	2	5	R	2	5/7
	5	R	2																
02	1	U	4	1	U	4	3	U	4	2	U	4	3	U	4				3/5
03	3	U	4	4	A	4	4	U	4	3	U	4	5	U	4				3/5
04	5	U	4	5	U	4	5	U	4	5	A	4	6	U	4				3/5
05	2	U	6	3	U	6	1	U	6										2/3
06	6	U	6	4	A	6	5	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing of relevant sketches	15
2	Preparation of report	15
3	Viva-voce	20
	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	2	-	-	-	-	-	-	-
2	-	-	-	-	2	-	-	-	-	-	-	-
3	-	3	-	-	-	3	-	-	-	3	-	-
4	-	3	3	-	-	-	-	-	-	-	-	-
5	-	3	3	-	-	-	-	3	-	-	-	-
6	-	3	3	-	-	3	1	3	-	3	-	1

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Handbook of Low Cost Housing 1st Edition	A.K. Lal, New Age International, 1st Edition, 2011	9788122407891, 8122407897
2.	Building an Affordable House: Trade Secrets to High-Value, Low-Cost Construction	Fernando Pages, Taunton Press, Edition: 2005	9781561585960, 1561585963
3.	Low Cost Housing in Developing Countries	G. C. Mathur, Oxford & I.B.H. Publishing Company Pvt. Ltd. Edition: 1993	9788120407749
4.	Advances in Building Material and Construction	Mohan Raj and M.P. Jaisingh Roorkee Central Building Research Institute 1986	-
5	Building Materials and Components	C.B.R.I. Roorkee	-
6	Ecohome 94	All India Seminar on low income housing	-
7	IS 8888-1993-Guide for requirement of low income housing	I.S. Code, Government of India.	-

❖ E-REFERENCES:

- <https://law.resource.org/pub/in/bis/S03/is.8888.1.1993.pdf> assessed on 1st September 2016
- <http://cbri.res.in/concrete-masonry-blocks/> assessed on 1st September 2016
- <http://cbri.res.in/wood-without-tree-rice-husk-plastic-wood/assessed on> 1st September 2016
- <http://esatjournals.net/ijret/2015v04/i25/IJRET20150425077.pdf> assessed on 1st September 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION
NIL

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. R. Kukadapwar	Lecturer in civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. R.N. Giradkar	Head of Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. M.R. Shelote	Consultant	M R Associates, Nagpur
4.	Dr. R. N. Khapre	Associate Professor	RCOEN, Nagpur
5.	Mr. A. J. Fulzele	Assistant Secretary (Tech.)	MSBTE, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

FREE ELECTIVES

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/MT/PK/AE/TX/TR
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FS501E
COURSE TITLE	: FINISHING SCHOOL
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK Hrs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: NIL

❖ RATIONALE:

Polytechnic Diploma pass outs who are not readily employable in the desired target jobs, need further grooming. Diploma engineers are not fit for relevant jobs in related work areas in corporate due to lack of required skills like communication, team work, arithmetic, public speaking, attitude building, ethics, business etiquettes etc. This 'disconnects' between the desired jobs and the qualifications obtained needs to be addressed by institutes. This course helps in bridging the gap between Formal education and Industry requirements. Industries and Institutes have a role to play. A pre-employment training programme in which curriculum is developed for students to prepare them for requirements of industries. It aims to provide soft skills to student to facilitate their employability and play a part in the supply side issues (of talent) of the industry. Students then can adapt themselves to the industrial scenario.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Perform SWOT analysis
- 2 Demonstrate soft skills.
- 3 Enhance employability skills.
- 4 Adapt ethics and values.
- 5 Practice interpersonal skills.
- 6 Refine communication skills.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes(Cognitive Domain)	Topics and subtopics	Hrs
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	- Identify Strengths and Weaknesses of Self - Observe Opportunities and Threats in Self - Exhibit different interpersonal skills in given situations.	A. Soft Skills Understanding self & others a. SWOT Analysis b. Interpersonal Skills	4
2	- Practise face to face communication in formal/informal groups. - Observe Body Language of others and note the changes in different persons. - Construct and demonstrate short public speech of five minutes on a topic of interest. - Identify signs and signals as a means of communication and list them.	A. Soft Skills Communication Skills a. Verbal & Non Verbal Communication b. Body Language c. Sixth sense Intuition d. Public Speaking	8
3	- Identify factors in self esteem. - Produce a list of behavioural elements of concentration. - Practise tongue twister to enhance power of concentration.	A. Soft Skills Self Confidence a. Strength of Conviction b. Power of Concentration c. Self Esteem	4
4	- Practise three different dress combinations for professional presentation. - Demonstrate three social manners and etiquettes in a group task	A. Soft Skills Presenting Self a. Fine Grooming b. Dress Sense c. Manners & Etiquettes	4
5	- Set career goals for next five years and list activities to achieve these goals. - Prepare a chart of daily routine activities with Important, Very important, Urgent and Very urgent	A. Soft Skills Effective Self Management a. Goal Setting b. Time Management c. Emotional Quotient d. Motivating self and	6

	classification. - Identify assertive behavioural aspects of persons in your surrounding - Identify factors/elements related to emotional balance in given situations.	Others e. Positive Thinking & Assertiveness	
6	- Practise yoga /meditation. - Prepare a habit plan and list steps for action plan. - Construct diet chart for self.	A. Soft Skills Personality Development a. Physical & Mental Health b. Habit formation- Do's & Don'ts c. Diet Pyramid	6
7	Exhibit attitude as response to various situations (case studies).	B. Employability Skills Attitudes	2
8	Demonstrate technical skills of different subjects.	B. Employability Skills Technical Skills	6
9	Observe the weakness domain of the individuals in given situations.	B. Employability Skills Adaptability	4
10	- Compose creative essay. - Suggest creative solutions to various given situations.	B. Employability Skills Creativity and Innovation	4
11	Exhibit team spirit and leadership qualities while working in a team.	B. Employability Skills Interpersonal Skills a. Working in Team b. Leadership	4
12	Practise Role play in group to exhibit corporate culture.	B. Employability Skills Corporate culture	4
13	- Prepare Resume. - Practise Group Discussions. - Demonstrate interview techniques through mock interview.	B. Employability Skills Job Selection Process a. Resume Writing b. Group Discussions c. Personal Interview	8
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Report writing	20
2	Presentation Skills	20
3	Viva voce	10
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (Pos)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	2	-	-	-	3	-	3	-	-
2	-	-	3	-	3	-	3	3	3	3	-	-
3	-	-	-	2	3	-	3	3	3	3	-	-
4	-	-	-	-	3	2	3	3	3	3	-	-
5	-	-	3	-	3	2	3	3	3	3	-	-
6	-	-	3	-	3	2	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	How to win friends and Influence people	Dale Carnegie, Fingerprint Edition 2016	10: 8175993480 13: 978-8175993488
2.	The SWOT Analysis	Lawrence G. Fine, Createspace Edition 2009	10: 1449546757 13: 978-1449546755
3.	Body Language	Allan Pease, Manjul Publishing House Pvt. Ltd., Edition 2014	10: 8183224105 13: 978-8183224109
4.	The Spark is Within You	Jagdish Bali, Authorspress, Edition 2016	10: 9352072332 13: 978-9352072330
5.	How to Read a Person Like a Book	Rupa Publications India, Edition 2012	10: 8129119188 13: 978-8129119186

6.	Believe in Yourself	Dr. Joseph Murphy, Manjul Publishing House Pvt. Ltd., 1 st Edition 2014	10: 8183225098 13: 978183225090
7.	Think and Grow Rich	Napoleon Hill, Jaico Publishing House; First edition 2007	10: 817992792X 13: 9788179927922
8.	Communication Skills	Sanjay kumar, Oxford Edition 2011	10: 0198069324 13: 9780198069324
9.	The Power of your Sub conscious Mind	Dr. Joseph Murphy, Amazing Reads Edition 2015	10: 8192910962 13: 9788192910963
10.	The Power of Positive Thinking	Norman Vincent Peale,	10: 0091906385 13: 9780091906382
11.	The Ace of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalaswamy Ramesh	10: 8131732851 13: 978-8131732854

❖ E-REFERENCES:

- https://en.wikipedia.org/wiki/Soft_skills accessed on 20th September, 2016
- <http://www.p21.org/about-us/p21-framework/262> accessed on 1st November 2016
- <http://innovationexcellence.com/blog/2012/08/04/whats-the-difference-between-creativity-and-innovation/> accessed on 10th October 2016
- <http://study.com/academy/lesson/self-understanding-and-self-concept.html> accessed on 20th October, 2016
- <http://www.skillsyouneed.com/ips/understanding-others.html> accessed on 20th October, 2016
- <http://articles.bplans.com/how-to-perform-swot-analysis/> accessed on 19th September, 2016
- <http://www.skillsyouneed.com/ips/body-language.html> accessed on 19th September, 2016
- <https://www.mindtools.com/CommSkll/PublicSpeaking.htm> accessed on 19th September 2016
- https://www.mindtools.com/pages/article/newHTE_90.htm accessed on 20th October 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. D.S. Kulkarni	HOD, Textile Manufacture	Government Polytechnic, Nagpur.
2.	Dr. Surendra Gole	Corporate HR Trainer, Former Principal,	Nagpur Institute of Technology, Nagpur
3.	Mr. Ashish Khole	Divisional Manager	TAL - Areospace Business Unit – (Tata Group of company) Nagpur
4.	Dr. Rozina Rana	Director	ELAN Finishing School, Priyadarshini Group of Institutions
5.	Mr. Sarang Sawangikar	Asstt. Vice President(HR)	Vidarbha Power Ltd., Butibori
6.	Ms. M.M.Machale	Lecturer in English	Government Polytechnic, Nagpur
7.	Dr. S.W.Rajurkar	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
8.	Mr. G.V.Gotmare	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/EE/EC/CM/IT/ TX/MT/PK
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE501E
COURSE TITLE	: BASIC BUILDING DRAWING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)
TH.TEE	: NIL
PR.TEE	: 02 HRs (Internal)
PT	: NIL

❖ RATIONALE:

Various agencies involved in engineering works use drawings as effective medium of communication. Engineering professionals of fields, other than civil engineering like mechanical, electrical, chemical, polymer mining, metallurgy etc. are required to interpret the space in the given building to assess whether their installations can be housed in the building or to specify the space requirements of their machineries, assemblies and installations. Moreover as an individual everyone of any profession wants to visualize his/her home before it is build, therefore these professionals need to study basic of building drawings such as plan, elevation and sections etc. This curriculum is designed to develop the basic skills of drawing building plan, elevation and section.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify different types of lines and symbols used in working drawings.
2. Prepare line plans of buildings for different orientations and with different scales.
3. Prepare plan, elevation and section of an existing building by taking measurements.
4. Develop working drawing duly considering rules, regulations and byelaws of sanctioning authority.
5. Identify the units and their sizes required in a building for serving a given purpose.
6. Interpret plan, elevation and section of building.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw different types of lines, common notations/symbols used in civil engineering and also symbols used in their field to be shown in the plan (A1size sheet).	Basics of Civil Drawing	10
2	Prepare line plans of small residential building (1BHK) for different plot orientation and with different scale on graph paper (A1size).	Drawing line plans	10
3	Prepare line plans of Public building like (Primary school building and Primary Health Centre) specifying names and sizes of different units. Prepare a separate report giving units, their sizes and justification for sizes.		10
4	Prepare a Measured drawing of institutional workshop/any small building. Show placement of machines/electrical fixtures etc.	Measured drawing	12
5	Develop a working drawing of any one of the building drawn in Practical no.2 considering rules, regulations and bye laws of local /other sanctioning authority.	working drawing	12
6	Draw plan and sectional elevation of Bifurcated/ Dog legged staircase.		06
7	Interpret dimensions and sizes of various units in the given building drawing.	Interpretation	04
Total			64

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Draw to the suitable scale a detailed plan of two room building.	20
2	Dimensioning	10
3	Neatness	10
4	Viva -Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	-	-	-	-	-	3	-	3	-	-
2	-	-	3	3	-	-	-	3	3	3	-	-
3	-	-	3	3	-	-	-	3	3	3	-	-
4	-	-	3	3	2	2	2	3	3	3	-	-
5	-	-	-	-	-	-	-	3	-	3	-	-
6	-	-	-	-	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building Drawing: With an Integrated Approach to Built Environment	M.G. Shah, C.M.Kale and V. Y.Patki Tata McGraw-Hill Publishing Company Ltd. 4 th edition, 2002	10:0074638769
2.	Building Planning and Drawing	Dr.Kumara Swamy and A. Kameshwara Rao , Charotar Publications , 8th edition, 2015	13:9789385039126
3.	Civil Engineering Drawing and House planning	B.P.Verma, Khanna Publications, 11 th Edition,1986	13:9788174091688
4.	Civil Engineering Drawing	Gurucharan Singh, Standard Publications, 2009	13:9788180140044
5.	Civil Engineering Drawing	R. S. Malik,G.S. Meo, Computech Publications ltd./ New Asian Publications, 5 th edition, 2015	13:9788173180026

❖ **E-REFERENCES:**

1. <http://bie.telangana.gov.in/Pdf/civilenggdrawing.pdf>, accessed on 3rd September, 2016
2. <http://www.iar.unicamp.br/lab/luz/ld/Arquitetural/livros/interior%20design%20student%20handbook.pdf>, accessed on 3rd September, 2016.
3. <https://law.resource.org/pub/in/bis/S03/is.962.1989.pdf> accessed on 3rd September, 2016
4. http://civilengineering-notes.weebly.com/uploads/1/1/7/5/11750056/building_bye_laws.pdf accessed on 3rd September, 2016
5. <http://civil.emu.edu.tr/courses/civ1103/Tutorial%205.pdf> accessed on 3rd September, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. R. N. Giradkar	Head of Civil Engineering Deptt.	Government Polytechnic, Nagpur.
2.	Dr. D. N. Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. S. R. Kukadapwar	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. M. K. Panchwate	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Dr. S. J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
6	Mr. M. R. Shelote	Consultant Engineer	M. R. Associates, Nagpur.
7	Dr. R. N. Khapre	Associate Professor	Ramdeobaba College of Engineering and Management, Nagpur
8.	Mr. A. J. Fulzele	Assistant Secretary (Technical)	MSBTE, Regional Office, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/EC/CM/IT/MT/PK/AE/TR/TX
LEVEL NAME	: FREE ELECTIVES
COURSE CODE	: FE502E
COURSE TITLE	: RAC MAINTENANCE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: NIL

❖ **RATIONALE :**

The knowledge of repair and maintenance of domestic refrigerator and air conditioner is helpful in daily life. One should acquire skills in carrying out basic repairs and maintenance of refrigeration and air conditioning.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify various components of refrigeration and air conditioner.
2. Handle various tools
3. Test and find faults in refrigerator and air conditioner
4. Diagnosis fault of refrigerator and air conditioner.
5. Practice maintenance procedure
6. Practice safety procedure.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical No.	Specific Learning Outcomes (Psychomotor Domain)	Topics	Hrs.
1.	Identify the components of domestic refrigerator and write report. Report includes- -Basic concept of refrigeration -Vapor Compression Refrigeration system -COP, Ton of refrigeration	Introduction to Refrigerator	10
2.	Identify the hand tools required for maintenance of domestic refrigerator. Use tools for various applications and write report. -Specification of tools	Hand Tools	04
3.	Dismantle compressor, identify various components in compressor and write report. Report includes – -Hermitically sealed compressor - various components of compressor	Compressor	08
4.	Test Electric circuit and electrical controls used in refrigerator and report writing. Report writing includes – -Electric circuit diagram -Various controls and its function	Electric circuit of refrigerator	04
5.	Identify various faults and write report Report includes – -Various faults - Remedies	Fault finding and maintenance of refrigerator	08
6.	Run water cooler test rig and Write report. Report writing includes- -Working of water cooler -various components of water cooler	Water cooler	04
7	Identify the components of air conditioning system and write report. Report includes- -Basic concept of air conditioning -Various air conditioning systems like summer AC, winter AC, comfort AC.	Air conditioning system	08
8	Identify of various faults and write report Report includes – -Various faults - Remedies	Fault finding of air conditioner	08
9	Test Electric circuit and electrical controls used in AC and report writing.	Electric circuit of air conditioner	04

	Report writing includes – -Electric circuit diagram -Various controls and its function		
10	Identify the components of car air conditioning system and write report. Report includes- -Basic concept of car air conditioning -function of various components of car AC	Car Air Conditioning system	04
Skill Assessment			02
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

NIL



❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing of Sketch, selection of equipment's, procedure etc.	20
2	Performance	10
3	Conclusion	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	-	-	-	-	3	3	-	-	-
2	-	-	3	3	-	-	-	3	-	3	-	-
3	-	-	3	3	-	-	-	3	3	3	-	-
4	-	-	3	3	1	-	-	3	3	3	-	-
5	-	-	3	3	-	-	-	3	3	3	-	-
6	-	-	3	3	1	-	-	3	3	3	-	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Refrigeration and air conditioning servicing	S. Kumar, New Heights Publication New Delhi	--
2.	Refrigeration and Air Conditioning	R.S. Khurmi, S.Chand and Co.	81-219-1687-9
3.	Refrigeration and Air Conditioning	C.P. Arrora, Tata Mc-Graw Hill,	0-07-451515-2
4.	Refrigeration and Air Conditioning	Manohar Prasad, New Age Publications.	13: 9788122414295
5.	Refrigeration and Air Conditioning	P.N. Ananthanarayanan; Tata McGraw Hill	0074620088

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Air conditioning trainer kit
2. Water cooler trainer kit
3. Ice plant trainer kit
4. Window Air conditioner
5. Split air conditioner
6. Domestic Refrigerator
7. Car air conditioning trainer kit

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Prof. O. V. Sarode	Head, Mechanical Engineering	Government Polytechnic, Nagpur
2	Dr. S. W. Rajurkar	Lecturer, Mechanical Engineering	Government Polytechnic, Nagpur.
3	Prof. D. J. Ghode	Lecturer, Mechanical Engineering	Government Polytechnic, Nagpur.
4	Prof. K. S. Thekedar	Lecturer, Mechanical Engineering	Government Polytechnic, Nagpur.
5	Er. A.M.Onkar	Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
6	Shri. G.F.Potbhare	Principal	NIT, Polytechnic, Nagpur
7	Dr.S.S.Baraskar	Lecturer in Mechanical Engineering	Govt. Polytechnic, Arvi

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/AE/PK/MT/EC/IT/CM /TX
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE503E
COURSE TITLE	: ELECTRICAL MAINTENANCE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT =2CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

Electricity is a basic need of human beings. All are dealings with the different electrical gadgets as well as electrical installations in day to day life. Therefore, the knowledge of electrical maintenance is must for all the peoples. One should have ability to acquire skills in carrying out repairs of electrical gadgets with accuracy and maintain the electrical installations. This course imparts the practical skills of electrical maintenance.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use electrical maintenance tools and equipment's.
2. Use fire-fighting equipment on different types of fires.
3. Test, Repair and maintain the domestic appliances.
4. Locate and repair the faults in electrical installation.
5. Identify the faults.
6. Follow safety precautions.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Identify electrical measuring instruments, sources, ICDP/ICTP, switches, loads, wires and execute safety precautions in laboratory.	Electrical Safety	4
2	Use firefighting equipment on different fire.		4
3	Identify different electrical maintenance tools and electrical accessories.	Maintenance Tools	4
4	Test single phase and three phase supply using test lamp and identify phase and neutral using test lamp.		4
5	Perform continuity, open circuit, short circuit and earth fault test using series test board.		4
6	Test and find fault in an automatic/ semiautomatic/ steam electric iron/toaster/room heater/hot plate	Domestic Appliances	4
7	Test, find faults and repair ceiling fan.		4
8	Test, find faults and repair electric mixer.		4
9	Identify different wiring systems in the premises & prepare list of accessories required for each.	Electrical Installation	4
10	Test & measure insulation resistance of Electrical lab wiring installation by using megger.		4
11	Measure the earth resistance of earth electrode by using earth tester.		4
12	Connect single phase and three phase energy meter to load and note the reading.		4
13	Prepare a wiring of two lamp controlled by two one way switch by using conduit wiring.		6
14	Fix ICDP/M CB/ DB/ELCB on wiring board & connect it to supply.		4
15	Locate the fault in electrical installation		4
Skill Assessment			2
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram/selection of equipment's/writing procedure etc.	10
2	Performance	20
3	Result	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	3	3	-	-	3	3	3	-	-
2	-	-	3	3	3	-	-	3	3	3	-	-
3	-	-	3	3	3	-	-	3	3	3	-	-
4	-	-	3	3	3	-	-	3	3	3	-	-
5	-	-	3	3	3	-	-	3	-	3	-	-
6	-	-	-	-	3	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Electrical Design Estimating and Costing	K.B. Raina and Dr. S.K. Bhattacharya, New Age International (P) Ltd. (2010)	10: 8122403638 13: 978-8122403633
2.	Study of Home Appliances	K. B. Bhatiya, Khanna Publication 2010 Edition.	1234567146703
3.	Home Appliances Servicing	E.P. Anderson, Audels	030114

❖ **E-REFERENCES:**

- <http://nptel.ac.in/courses/108108076/1> , assessed on 18th January 2016
- <http://www.electrical4u.com> , assessed on 18th January 2016
- <https://www.youtube.com/watch?v=A9KSGAnjo2U>, assessed on 18th January 2016
- <http://www.electricaltechnology.org/2015/09> assessed on 30 Jan 2016
- www.slideshare.net/bawaparam/made-by-param assessed on 30 Jan2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Electrical Maintenance Tool Kit.
2. Megger 500V Hand driven
3. Earth tester 3 spike.
4. Digital Multi-meter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C.S.Thorat	Principal	Government Polytechnic, Nagpur.
2.	K.M.Gaidhane	I/C, Head of Electrical Engineering	Government Polytechnic, Nagpur.
3.	R.I.Kamble	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
4.	S.P.Thote	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
5.	Dr. R.S.Surjuse	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
6	G.V.Gotmare	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
7	H,N.Kharkar	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
8	N.H.Adkine	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
9	A.P. Gandhi	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
10	Bhashkar Bale	Dy. Executive Engineer,	MSTCL, Nagpur
11	R.Y.Ghormade	Head of Electrical Engineering	Dharampeth Polytechnic, Nagpur
12	DR. S.S.Bharatkar	Lecturer in Electrical Engineering	Government Polytechnic, Amaravati.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/ME/CM/IT/PK/AE/TX/TR
LEVEL NAME	: PROFESSIONAL ELECTIVE
COURSE CODE	: FE504E
COURSE TITLE	: HOBBY ELECTRONICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs
PT. EXAM	: NIL

❖ RATIONALE:

Some students may be interested in interdisciplinary approach therefore it is felt that diploma holder those who have interest in "Hobby Electronics Circuits" must have minimum competency and knowledge of it, so later on some student may take up it as business. Therefore this course has been kept as one of free elective interdisciplinary course in the curriculum.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Identify different electronics components.
- 2 Handle electronics circuit development tools & test and measuring equipments.
- 3 Select the hobby electronics circuits as per requirements.
- 4 Test the electronics components and circuits.
- 5 Develop the simple electronics hobby project.
- 6 Present electronics project.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Hrs.
1	Identify and understand different electronics components. -like. resistor, capacitor, inductor, diode, transistor, relay etc.	04
2	Observe and draw Symbols and unit of measurement for electronics parameters like voltage, current, resistor, capacitor, inductor etc.	04
3	Identify the applications of basic electronics test and measuring equipments. Like multimeter LCR meter, Cathode Ray Oscilloscope, Function generator etc.	08
3	Perform the basic handling skill of electronics circuit development tools like soldering gun, de-soldering pump etc	04
4	Test different electronics components like resistor, capacitor, inductor, diode, relay etc.	08
5	Identify simple electronics Hobby circuits by referring journals, websites, and hobby electronics manuals.	04
6	Arrange electronics component and PCB (general purpose) for selected circuit and their testing.	08
7	Prepare component layout of selected electronics circuit.	04
8	Mount and solder electronics components on PCB (general purpose)	08
9	Perform Testing, fault finding, rectification of fault. of circuit.(Test the circuit for performance and rectify the fault)	06
10	Perform the final testing of circuit & packaging.	04
Skill Assessment		02
Total Hrs		64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

NIL

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
2	Performance–Demonstration of project work	25
5	Viva voce	25
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-			-	-		3	-	3	-	-
2	-	-	3	3	-	-	3	3	-	3	-	-
3	-	-			-	-	3	3	-	3	-	-
4	-	-	3	3	-	-		3	-	3	-	-
5	-	-	3	3	-	-	3	3	-	3	-	-
6	-	-	3	3	-	-		3	1	-	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Electronic For You	Journal	--
2.	Electronics Material And Components	Dr. MadhuriA. Joshi, , Shroff Publisher & Dist. Pvt. Ltd. 3 rd Edition,	10: 8173669007 13: 9788173669002
3.	Data Books Of Electronic Components & Devices	Business Promotion Bureau	--

❖ **E-REFERENCES:**

- ❖ Websites www.electronicprojects.com , assessed on 4th May 2016
- ❖ Websites www.circuittoday.com assessed on 4th May 2016
- ❖ Websites www.electroschematics.com assessed on 4th May 2016
- ❖ Websites www.hobbyelectronics.in assessed on 4th May 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Digital Multi-meter
2. LCR-Q meter
3. Cathode Ray Oscilloscope
4. Soldering Gun.
5. De-soldering Pump.
6. Nose Plier

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	S.S.Tadas	HOD, Electronics Telecomm. Engg.	Government Polytechnic, Nagpur.
2.	A.A.Ali	Lecturer (Selection Gr.) Electronics Telecomm. Engg.	Government Polytechnic, Nagpur.
3.	D.A.Brahmankar	Lecturer (Selection Gr.) Electronics Telecomm. Engg.	Government Polytechnic, Nagpur.
4.	U.M.Ramteke	Lecturer (Selection Gr.) Electronics Telecomm. Engg.	Government Polytechnic, Nagpur.
5.	Mr. Sandip V Darwhekar	Director	Beta Computronics Pvt Ltd , Nagpur
6.	Mrs. Gazzala Ali	Head Electronics	Anjuman Polytechnic , Nagpur
7.	Mr S M Kale	Lecturer Electronics	Government Polytechnic, Gadchiroli.

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 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/IT/CM/AE/MT/TX
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE505E
COURSE TITLE	: BASIC PACKAGING TECHNOLOGY
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT =2CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ **RATIONALE:**

Packaging is the need of every manufactured commodity. Safe delivery of product to end user through package has got many expectations. Packaging has a various functions and aspects. Packaging process starts as soon as finished product is ready. The package with the product is subjected to various situational hazards. The success of packaging largely depends on how these hazards have been considered and taken care of. This all requires a panoramic or holistic view about the field of packaging.

The concept & technology of packaging has taken years together to develop to where it is today, through evolution of technology, market and business. In spite of being a value to the business and developing economy, packaging by virtue of consuming resources, creating solid waste and pollution, is posing a grave threat to the environment.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to -

1. Collect various primary and secondary packages.
2. Identify the packaging materials and appreciate their properties.
3. Identify product characteristics of a packaged product.
4. Estimate the hazards to the package along with its contents.
5. Record by testing/ measurement/ observation various parameters of a package.
6. Search web resources on environmental issues related with packaging.

❖ **COURSE DETAILS:****A. THEORY :**

Unit Number and Name	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Introduction to Packaging. - Form suitable number of groups of students. - Collect 05 empty packages/ containers of different products. (Primary & Secondary packages) Products may be assigned by the course teacher. - Prepare a list of the packages and the products they contained. - Submit the list along with the collection.	Introduction	02
2.	Assort the collection of various packages by the class into primary and secondary packaging. - Classify the collected packages into Primary, Secondary & Primary as well as Secondary packaging. - Classify the collected packages into Rigid, semi-rigid and flexible packaging. - Note down the classification. - Identify the material/ materials of the packages. - Measure the physical parameters/ characteristics of the packages/ packaging material such as dimensions, weight, thickness, size, etc. - Prepare a power point presentation on it. - Attach the print out of above presentation in the Journal.	Packaging Materials	12
3.	Identify the product properties/ characteristics and estimate packaging functions. - Select appropriate number of products from the collection. - Identify various physical/ physiochemical properties of the products influencing its packaging. - Predict the functions of the packaging material and the package. - Classify predicted functions into Technical/ Primary and Commercial/ Secondary functions of packaging. - Prepare a brief report on it and attach in the Journal.	Product Characteristics	10
4.	Identify the fitness for use of the product contain by its packaging.		

	- Collect at least one package each of – one Perishable food and one Pharmaceutical Product. - Examine the date of manufacture, expiry/best before. - Note down above information and collect the information on usage of unfit products.	Packaging Communication	04
5.	Judge the hazards of handling, warehousing and transportation. - Observe the printed communication on the package and find out the manufacturer and its geographical location. - Trace out the method of handling, warehousing and transportation. - Outline the distribution channel. - Estimate the hazards to the products and packaging due to of handling, warehousing and transportation. - Interpret material handling instructions as printed on the packaging. - Write a report.	Packaging Hazards	12
6.	Carryout following tests on packaging materials and dummy packages. - Drop test. [IS : 7028 (Part 4) – 1987] - Puncture resistance test. (T 803 om-88) - Rolling test [IS : 7028 (Part 5) – 1987] - Vibration test. IS : 7028 (Part 2) - 2002 - Box compression test. (T 804 om-89) - Analyse the test results.	Package Testing	10
7.	Conduct a Survey/ Case study on environmental burdens caused by Packaging. - Select a Packaging Industry. - Visit to the industry or search information through web resources. - Gather information on different operations performed by the industry. - Study the impact of those operations on environment. - Appreciate 3-R concept (Reduce, Reuse and Recycle) - Prepare presentation.	Survey	12
Skill Assessment			02
Total			64

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identification	10
2	Drawing / flowchart/schematics/symbols	10
3	Procedure/involvement/performance	10
4	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	-	-	-	-	3	3	3	-	-
2	-	-	-	-	-	-	-	3	3	3	-	-
3	-	-	-	-	-	-	-	3	3	3	-	-
4	-	-	3	-	-	-	-	3	3	3	-	-
5	-	-	3	2	-	-	2	3	3	3	-	-
6	-	-	-	-	1	1	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Fundamentals Of Packaging	F.A. Paine, Newnes-Butterworth, 1973	13: 9780408001076
2.	Packaging users Handbook	F.A. Paine, Springer; 1991	13: 9780751401516
3.	The Packaging Media	F.A. Paine, Blackie Academic & Professional, 1977	13: 9780216901919
4.	Packaging In The Environment	edited by Geoffrey M. Levy	13: 9780751400915
5.	The Wiley Encyclopedia of Packaging Technology.	Marilyn Bakker, John Wiley & Sons Inc. Canada	0471-80940-3
6.	Fundamentals of Packaging Technology	S. Natrajan, M. Govindrajan, B. Kumar, 2E, PHI LPL, Delhi, 2014	978-81-203-5054-0

❖ **E-REFERENCES:**

1. <http://www.iip-in.com/site/default.aspx>
2. <https://books.google.co.in/books?isbn=0470541385>
3. <http://pkt.jinakarn.com/ept.pdf>
4. <http://www.boschpackaging.com/en/pa/homepage/homepage.html>
5. <https://www.youtube.com/watch?v=LbxXpP9ysjo>

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Bursting Strength tester
2. Box compression strength tester
3. Drop tester
4. Universal testing machine
5. Puncture testing machine
6. Edge compression tester

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Prof. R.S.Raool	I/C, Head of Packaging Technology	Government Polytechnic, Nagpur.
2.	Prof. A.S.Bhagat	Lecturer in Packaging Technology	Government Polytechnic, Nagpur.
3.	Prof. Imran K.Syed	Lecturer in Packaging Technology	Government Polytechnic, Nagpur.
4.	Prof. A.P.Pardey	Lecturer in Paper and pulp	Government Polytechnic, Nagpur.
5.	Prof. S.N.Madhugiri	Academician, Ex Principal & Retired Head of	Dharmapeth Polytechnic Nagpur & Dept. Packaging Technology G.P.Nagpur
6.	Prof. P.P Sargaonkar	Consultant & Retired Lecturer in Packaging Technology	Government Polytechnic, Nagpur.
7.	Prof. M.S.Deshpande	BTE Repetitive & Lecturer in Mechanical Engineering	Government Polytechnic, Bramhapuri.
8.	Shri. Suresh Thakur	Industry Expert, Managing Director,	Palekar Food Products, MIDC, Amravati.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/TX

LEVEL NAME : ELECTIVE COURSES

COURSE CODE : FE506E

COURSE TITLE : INDUSTRIAL METALLURGICAL PRACTICES

PREREQUISITE : NIL

TEACHING SCHEME : TH: 00; TU: 00; PR: 04(CLOCK HRS.)

TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : NIL

PR. TEE EXAM : 02 HRS (Internal)

PT. EXAM : NIL

❖ **RATIONALE:**

A technician comes across the various problems in metallurgical industries. Also, at the work place, it is always necessary, to tackle the problem so that the sound metallurgical product can be obtained by application of suitable metallurgical engineering techniques. Hence, the basic knowledge of various industrial metallurgical practices is necessary for a technician. This course helps to impart the basic knowledge to technician for increasing the productivity and a sound metallurgical product.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Draw sketches of different tools/machines in metallurgical shops/labs
2. Use of tools and machinery in different metallurgical labs/shops.
3. Operate different equipments/machineries used in basic Metallurgical labs/shops
4. Perform inspection and testing of metallurgical products.
5. Prepare sample for microscopic examination.
6. Choose proper tool for different metallurgical processes.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Observe the demonstration of hand tools, machine Tools and equipments used in pattern making and mouldings shops and draw the sketches and write specifications, details, applications of above tools.	Pattern making and Moulding	02
2.	Prepare sand mould by using any one pattern (mould to be prepared by group of 2 to 4 students depending on volume of work)		08
3.	Observe the demonstration of hand tools, machine Tools and equipments used in casting shop and draw the sketches and write specifications, details, applications of above tools.	Casting	02
4.	Prepare one casting related to mould prepared. (any one type of casting to be prepared by group of 2 to 4 students depending on volume of work)		08
5.	Observe the demonstration of hand tools, machine Tools and equipments used in metal working operations (rolling, wire drawing, etc) and draw the sketches and write specifications, details, applications of above tools.	Metal working	02
6.	Perform practical related to any one metal working operations		08
7.	Observe the demonstration of hand tools, machine Tools and equipments used in heat treatment Shop and draw the sketches and write specifications, details, applications of above tools.	Heat treatment	2
8	Prepare sample for Performing heat treatment operation and conduct any one heat treatment to steel/cast iron sample		8
9	Observe the demonstration of hand tools and equipments used in testing and inspection lab and draw the sketches and write specifications, details, and applications of above tools.	Testing and inspection	2
10	Carry out various necessary testing and write the test report for any one metallurgical product.		8
11	Observe the demonstration of hand tools, machine Tools and equipments used in metallographic lab and draw the sketches and write specifications, details, applications of above tools.	Metallography	2
12.	Prepare one sample for metallographic examination and examine the sample under metallurgical microscope and draw the structure.		8
Skill Assessment			4
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing diagram/ selection of equipment's/ writing procedure etc.	10
2	Performance	20
3	Calculation/Result/ Drawing Graphs(if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	-	3	-	-	-	3	-	3	-	-
2	-	-	3	3	-	-	-	3	3	3	-	-
3	-	-	3	3	-	-	-	3	3	3	-	-
4	-	-	3	3	-	-	-	3	3	3	-	-
5	-	-	3	3	-	-	-	3	3	3	-	-
6	-	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Principles of metal castings	Dr. P.C. Mukharjee	81-20300716-X
2.	Foundry Engineering	Shrinivasan	81-7409-026-6
3.	Introduction to Physical Metallurgy	Sidney H. Avner McGraw-Hill international edition, 2 nd edition	0-07-085018-6
4.	Testing of materials by	Prof. A.V.K. Suryanarayana.	81-20300716-X
5	The Testing & Inspection of Engineering materials,	H. E. Davis, G. E. Troxell, McGraw Hill	81-7409-026-6
6	Mechanical Metallurgy	George Dieter, McGraw Hill,	0-07-084453-4
7	Heat treatment Principles and techniques	T.V. Rajan , C.P. Sharma, Prentice Hall of India Pvt. Ltd, 12 th edition	81-20300716-X

❖ **E-REFERENCES:**

<http://books.google.co.in/books/isbn=9380026757> , assessed on

17th March 2016

<http://www.youtube.com/watch?v=101M1kaZIFg> , assessed on 27th April 2016

http://www.youtube.com/watch?v=1HuxDVpy_iv , assessed on 27th April 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Patterns
2. Foundry tools
3. Welding Transformer (Oil Cooled) Three Phase
4. Pit type furnace
5. Mould boxes
6. Crucibles
7. Muffle furnace
8. Mould shaking machine
9. Draw bench
10. Rolling mill
11. Grinder
12. Polishing machine
13. Hardness tester
14. Microscopes
15. NDT equipments

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	K.L.Meshram	Head of the Dept Department of metallurgical Engineering	Government Polytechnic, Nagpur.
2.	Ms. V.C. Humney	Lecturer in Metallurgical Engineering	Government Polytechnic, Nagpur.
3	S.M.Waikar	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur
4.	Y.Y. Mahajan	Assist. Professor , Metallurgy & Material Science	VNIT Nagpur
5	S.B.Varadpande	Managing director	Orange city alloys Pvt. Ltd Nagpur
6	Y. K. Gaiky	Lecturer Mechanical Engineering	Government Polytechnic, Sakoli

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/AE/MT/PK/TX
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE507E
COURSE TITLE	: COMPUTER NETWORK
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(TH/TU CREDIT = 00 CLOCK HR., 1PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

The world in the information era has become network centric. A Computer networks has been growing with rapid technological progress. Computer communication through networking becomes essential part of our life. We can manage many application like Air Line Reservation, Railway Reservation, E-banking, E-Governance, On-Line shopping, E-learning etc. by clicking mouse button from our own place. Because of this, world become the global village. By considering importance of networking towards all aspects of our life, we here introduce basic concept of networks, network classification, network topologies, network devices, Transmission media, Network reference models, concept of TCP/IP.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify network and network topologies.
2. Connect and handle different networking devices.
3. Identify network architecture and physical media used to connect computers in network.
4. Identify E-Commerce and E-Governance website on the internet.
5. Use and share Network Recourses.
6. Use various Internet and Intranet Applications

❖ **COURSE DETAILS:****A. THEORY: NIL**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Identify different types of network.	1.Introduction to Computer network and topologies	2
2.	Identify different network topologies.		2
3.	Connect and identify different Transmission Media.		4
4.	Connect and identify different network controlling devices like hub, switches etc.		4
5.	Connect computers in star topology by using wired media and with any network device (eg. Hub)		4
6.	Install and configure LAN card.	2.Local Area Network	4
7.	Prepare a Straight Cable and Network Cross over Cable and test by Line Tester.		4
8.	Share different devices like printer, scanner etc. over LAN network.	3.Applications & Uses of Computer network	2
9.	Share a printer on a network & print a document on it from a different computer on a network		2
10.	Share files and directories from one computer to other computer on the network.		2
11.	Install Win Messenger on LAN network.		2
12.	Create ID on Win messenger.		2
13.	Communicate through Win Messenger over LAN network.		4
14.	Connect through WAN network	4.Wide Area Network	4
15.	Create Email-ID on any WAN software like Gmail, Rediff, Yahoo etc.		4
16.	Communicate through any WAN software.		4
17.	Search information on the internet.		2
18.	Identify different E-commerce website on the internet like amazon.com, ebay.com etc.	5.Concepts of E-Commerce	2
19.	Connect through any E-commerce website on the internet and learn the procedure to buy books.		2
20.	Identify different E-Governance website on the internet like irtc.co.in etc.	6. Introduction to E-Governance	2
21.	Connect through E-governance railway website on the internet and learn the procedure for online railway reservation.		2
Skill Assessment			4
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:NIL**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:NIL**

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection, writing steps, installation etc.	10
2	Connection and configuration.	10
3	Performance	20
5	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	-	-	-	-	3	3	3	-	-
2	-	-	3	3	-	-	-	3	3	3	-	-
3	-	-	3	3	-	-	-	3	3	3	-	-
4	-	-	3	-	-	-	-	3	3	3	-	-
5	-	-	3	3	-	-	-	3	3	3	-	-
6	-	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Computer Networks	Andrew S Tannenbaum, Tata McGraw-Hill Edition, 2012	9780132126953
2.	Fundamentals of computer	E Balaguruswamy, Tata McGraw-Hill Education Pvt. Ltd., 2009	9780070141605
3.	Computer Basics	Micheal Miller, Tata McGraw-Hill Edition, 2012	0789734206
4.	Complete Reference Networking	Craig Zacker, Tata McGraw-Hill Edition	0132126958

❖ **E-REFERENCES:**

<http://www.pcworld.com/article/116583/article.html> , assessed on 20th April 2016

<http://www.computerstepbystep.com/computer-maintenance.html> , assessed on 20th April 2016

<https://www.youtube.com/watch?v=a0rEXzyX0-8>, assessed on 20th April 2016

❖ **LIST OF MAJOR COMPONENTS/DEVICES WITH THEIR SPECIFICATION.**

1. Operating System(Windows 98/2000/XP/7/8/8.1/10)
2. CPU Intel core i3/i5/i7
3. Hub(4 port USB hub, TB-226)
4. Switches
5. Connectors(RJ45/BNC/AUI/FIBER)
6. Printers(INK JET/LASER)
7. Scanner(FLAT BED)
8. Crimps, Strips and cut tools(HT-200R, HT-2008R)

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr. S.P. Lambhade	Head of Computer Engineering	Government Polytechnic, Nagpur.
2	Dr. Mrs. A.R. Mahajan	Head of Information Technology	Government Polytechnic, Nagpur.
3.	Ms. Shifa S. Sayyed	Lecturer in Information Technology	Government Polytechnic, Nagpur.
4.	Mrs. V A Raje	System Analyst(Lecturer in Computer Engineering)	Government Polytechnic, Nagpur.
5.	Ms. Gayatri B. Chavan	Lecturer in Computer Engineering	Government Polytechnic, Nagpur.
6.	Shri. Atul Upadhyay	COE	Vista computers, Ramnagar, Nagpur
7.	Shri N. V Chaudhri	Asst. Professor (CSE)	DBACEO ,Wanadongri, Nagpur
8.	Shri Manoj Jethawa	HOD, Computer Science	Shri DattaMeghe Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA INCE/ME/EE/EC/PK /TR/AE/TX/MT
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE508E
COURSE TITLE	: PC ARCHITECTURE AND MAINTENANCE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 02 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

As computers are heavily used for most of the activities like office automation, database management etc, the repair and maintenance of computer and its peripheral devices is becoming an essential part of the information technology. This course will enable the student to assemble different types of computer system and maintenance of different supporting equipments like printer, scanner, etc.

❖ COURSE OUTCOMES:

After completing this course students will be able to –

1. Assemble and de-assemble computer system.
2. Perform different setting on various types of printers.
3. Install various types of software's.
4. Install operating system and device drivers in system.
5. Handle computer system hardware.
6. Maintain peripheral devices.

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Identify all the peripheral devices.	1. Pc Motherboard And Its Components	2
2.	Identify all components mounted on motherboard.		2
3.	Perform Basic Input/output System (BIOS) setting and configuration setup using Complementary Metal Oxide Semiconductor (CMOS).		4
4.	Install CDROM drive to system.	2. Storage Devices And Interfacing	2
5.	Copy data on CD, DVD		2
6.	Install different types of cards such as Video Graphics Array (VGA) or Super Video Graphics Array (SVGA) display ,sound card ,LAN card, multimedia cards etc.	3.Display Devices And Interfacing	2
10.	Perform different printer settings on different types of printers. Write down the function of each switch.	4. Input And Output Devices	4
11.	Format, partition and install a Hard Disk Drive (HDD).		4
12.	Identify components of Hard Disk Drive (HDD) as a storage device.		2
13.	Connect scanner, scan documents and pictures on the scanner available in your lab. Sample printout be attached		4
14.	Install Internal and External Modem		4
16.	Per form Internet installation.		2
17.	Connect Switched Mode Power Supply (SMPS) and identify different parts of SMPS.	5. Power Supplies	4
18.	Connect Uninterrupted Power Supply (UPS) and write down function of it.		2
19.	Connect speakers and microphones to system.		2
20.	Assemble, de-assemble computer system.	6.Troubleshooting And Tools	4
21.	Identify installed computer peripherals and test their working using diagnostic software		4
22.	Find faults related to Monitor, CPU, Hard disk, Printer and other peripherals.		4
23.	Form a pico based net using Bluetooth devices and transfer data.		4
24.	Create bootable CD and Install an operating system		2
Skill Assessment			4
Total hours			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:NIL**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:NIL**

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End Of Course		End Of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing steps, selection, procedure	10
2	Performance	20
3	knowledge/block diagram/connection	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	3	-	-	-	3	3	3	-	-
2	-	-	3	3	-	-	-	3	3	3	-	-
3	-	-	3	3	-	-	-	3	3	3	-	-
4	-	-	3	3	-	-	-	3	3	3	-	-
5	-	-	3	3	-	-	-	3	3	3	-	-
6	-	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Upgrading and repairs PCS	Pearson, Scott Mueller, 20 th Edition, 2012	13: 9780789747103
2.	Troubleshooting Your PC	Mr. David Stone & Alfred Poor, Prentice Hall India, 2000	13: 9780735614901
3.	A+ Complete	David Groth, BPB Publication, 2006	13: 9780782128024
4.	Computer Installation and Servicing	Balasubramaniam, Tata McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 9781259082467

❖ **E-REFERENCES:**

<http://www.pcworld.com/article/116583/article.html> , assessed on 26th April 2016

<http://www.computerstepbystep.com/computer-maintenance.html> , assessed on 26th April 2016

<https://www.youtube.com/watch?v=a0rEXzyX0-8>, assessed on 26th April 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Operating System(Windows 98/2000/XP/7/8/8.1/10)
2. CPU Intel core i3/i5/i7
3. Fiber optics cable(LSFH Polymer)
4. Unshielded Twisted pairs cable(CAT 1 to CAT5)
5. Connectors(RJ45/BNC/AUI/FIBER)
6. Printers(INK JET/LASER)
7. Scanner(FLAT BED)
8. Crimps, Strips and cut tools(HT-200R, HT-2008R)

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. Mrs. A.R. Mahajan	Head of Information Technology	Government Polytechnic, Nagpur.
2	Mr. S.P. Lambhade	Head of Computer Engineering	Government Polytechnic, Nagpur.
1.	Ms.I.G.Lokhande	Lecturer in Information Technology	Government Polytechnic, Nagpur.
2.	Mrs.V.A.Raje	Lecturer in Computer Engg.	Government Polytechnic, Nagpur.
3.	Mrs.D.P.Chanmanwar	Lecturer in Information Technology	Government Polytechnic, Nagpur.
4.	Shri. Atulupadhyay	COE	Vista computers, Ramnagar, Nagpur
5.	Shri N. V Chaudhri	Asst. Professor (CSE)	DBACEO ,Wanadongri, Nagpur
6	Shri Manoj Jethawa	HOD, Computer Science	Shri Datta Meghe Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/AE/PK/MT/EC/IT/CM /TR
LEVEL NAME	: FREE ELECTIVE COURSES
COURSE CODE	: FE509E
COURSE TITLE	: FABRIC SELECTION AND CARE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

Clothes are as important as food and shelter. You use them for covering, protecting and even decorating yourself. You must be having different types of clothes for different occasions like your casual attire, office wear, party dresses, and your night suit and so on. In this course technology and science behind selection of right fabric and its care is illustrated.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Judge the fibres by means of a physical test.
2. Select the yarn and fabric.
3. Illustrate and draw care labels in Textiles.
4. Identify the different methods for different stain removal from textiles.
5. Perform stain removal on fabric.
6. Suggest precaution for storage of textiles.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practic als	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare textile fibre classification chart.	Fibre	4
2.	Detect the fibre type by means of physical test.		6
3.	Select the different types of yarn and fabric	Yarn	4
4.	Prepare chart of classification of yarn with their end uses.		6
5.	Identify different fabric formation methods.	Fabric	4
6.	Draw the plain and twill weaves on graph paper.		6
7.	Judge quality of textiles based on fibre, yarn and weave.	Selection of Textiles	4
8.	Prepare a chart of removal of different types of stain in a fabric and		6
9.	Perform stain removal on a given fabric.	Care of Textiles	4
10.	Draw care label symbols with instructions for fabrics.		6
11.	Collect 10 garment samples and note the care labels instructions	Maintenance of textiles	4
12.	Prepare the list of precautions necessary for storage of textiles.		6
Skill Assessment			4
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF JOB EVALUATION:**

S.N.	Description	Max. Marks
1	Chart preparation	10
2	Analysis of fabric samples	20
3	Draw symbols/diagrams / sketches	10
4	Viva voce	10
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	3	-	-	-	3	3	3	-	-
2	-	-	3	3	-	-	-	3	3	3	-	-
3	-	-	3	3	1	-	-	3	3	3	-	-
4	-	-	3	3	-	-	-	3	3	3	-	-
5	-	-	3	3	-	-	-	3	3	3	-	-
6	-	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Textile Fabrics:: Their Selection And Care From The Standpoint Of Use, Wear, And Launder ability,	George Henry Johnson : Harper & Brothers (1927)	B000863N32
2	Textiles	Sara J. Kadolph, Pearson Prentice Hall, 2007	0131187694, 9780131187696
3	Fabric Care	Noemia, D Souza : New Age international,1998	978-81-224-1143-0
4	Fundamentals of Textile and their care	Sushila Dantiyagi : Orient Longman private limited, 2006	8125010270

❖ **E-REFERENCES:**

1. <http://www.textileassociationindia.org/> assessed on 20/9/2016
2. <http://www.fiber2fashion.org/>
3. <http://www.nift.ac.in/>
4. www.itamma.org/
5. <http://www.fabriclink.com/> assessed on 20/9/2016
6. <http://download.nos.org/srsec321newE/321-E-Lesson-22.pdf> assessed on 20/9/2016
7. <http://download.nos.org/srsec321newE/321-E-Lesson-26.pdf> assessed on 20/9/2016

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. D. S. Kulkarni	Head of Textile Department	Government Polytechnic, Nagpur.
2.	Dr. S. B. Muttagi	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3.	Mr. S. G. Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur
4.	Dr. C. P. Kapse	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
5.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
6.	Prof. G.S. Kakad	Head of Textile Department	JDIT, Yavatmal
7.	Mr. R.N.Yadav	President	RSR Mohota Spinning and Weaving Mill

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/TX/MT/PK/IT/TR
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE510E
COURSE TITLE	: TWO AND FOUR WHEELER TECHNOLOGY
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

Today majority of people using a vehicle and it becomes a common need of daily life. Therefore, it is felt that one must have knowledge about the various systems and their functional importance and working in the context of automobile and its maintenance. The course aims to impart basic skills and understanding of two and four -wheeler systems basic components their working principle and basic maintenance procedure. Hence, this course has been offered for student of various diploma programme as one of the Allied Courses as “Credit Non-Exam Course”

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- Identify various systems of two wheeler.
- Identify various systems of four wheeler.
- Use different tools required for preliminary maintenance of vehicle.
- Practice to drive two and four wheeler vehicle or simulator.
- Practice various technique and procedure for finding general fault and repair them
- Prepare a report on Motor Vehicle Rules, Road Signals safety and precautions etc.

❖ COURSE DETAILS:

❖ A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
NIL			

❖ **B. PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various systems of two wheeler and write report. Report includes- -Classification of two wheeler -Block diagram of various system of two wheeler -function of various systems.	Introduction to Automobile	04
2	Identify the various systems of four wheeler and write report. Report includes- -Classification of four wheeler -Block diagram of various system of four wheeler -function of various systems.		06
3	Use off hand tools and special tools required for maintenance of two and four wheeler vehicle.		06
4	Prepare a report on Motor Vehicle act and traffic signs. Reports includes- -Various motor act. -Driving license requirement. -Traffic signs. -Insurance of vehicle.	Motor Vehicle Act	10
5	Practice four wheeler driving training on simulator.		20
6	Identify below mention faults in two wheeler and repair them. 1) Starting Problem. 2) Mileage Problem. 3) Pick-up Problem. 4) Abnormal sound from Engine and Transmission System.	Fault finding and maintenance of Automobile	08
7	Identify below mention faults in Four wheeler and repair them. 5) Starting Problem. 6) Mileage Problem. 7) Pick-up Problem. 8) Abnormal sound from Engine and Transmission System.		08
Skill Assessment			02
Total hours			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:NIL**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:NIL**

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing of Sketch, selection of equipment's, procedure etc.	20
2	Performance	10
3	Conclusion	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	-	-	-	-	-	3	3	3	-	-
2	-	-	-	-	-	-	-	3	3	3	-	-
3	-	-	-	3	3	-	-	3	3	3	-	-
4	-	-	3	3	3	-	3	3	3	3	-	-
5	-	-	3	3	3	3	-	3	3	3	-	-
6	-	-	-	-	3	3	3	3	3	3	-	-

1-Slight (Low) 2-Moderate (Medium) 3 –Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Automobile Engineering Vol.I	Dr. Kripal Singh, Standard Publishers Distributors, 13th Edition, 2013	97881801419669
2	Automotive Mechanics	S. Srinivisan,Tata McGraw – HILL, 2nd Edition, 2003	9780070494916
3.	Basic Automobile Engineering	Nakra CP , Dhanpat Rai Publishing Company (P) Limited,2009	9788187433224
4.	Automotive Mechanics	S. Srinivisan,Tata McGraw – Hill, 2 nd Edition, 2003	9780070494916
5	The Motor vehicle Act	Goverment Publication, 1989.	Government Publication

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS**

- ❖ Air compressor-1 HP 3 phase, Max Pressure: 4, 95 kg/cm², 70 ltr.
- ❖ Engine Crane –Hydraulic, 2 ton Capacity.
- ❖ Bottle/Floor/Scissor Jacks- 3 ton Capacity.
- ❖ Two Post Lift- Capacity 3.5 Ton, Max Lifting ht - 1830 mm, Min Lowering height - 110 mm, Post height - 3700 mm Lifting time - 55 Secs, Width between posts : 2800 mm, with 1 HP / 2 HP power pack 1 or 3 phase
- ❖ Air hydraulic press - Capacity: 30 Ton. Air pressure: 100-140 PSI. 2 Press plates included (designs may vary) Air inlet fitting: 1/4" NPT
- ❖ Socket/ Impact wrenches- 1/4", 3/8", 1/2" and 3/4"
- ❖ Torque wrenches- 3/8", 1/2" and 3 NM, Ratcheting type/Click-type.
- ❖ Driving simulator.
- ❖ Road signs.
- ❖ Vehicle with two paddle control.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr.K.S.Dixit	I/C, Head of Automobile Engineering	Government Polytechnic, Nagpur.
2.	Mr. S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr. R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr. Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr. V.S.Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.R.Yadgire	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/AE/PK/MT/EC/IT/CM /TX
LEVEL NAME : FREE ELECTIVES
COURSE CODE : FE511E
COURSE TITLE : ENERGY CONSERVATION AND MANAGEMENT
PREREQUISITE : NIL
TEACHING SCHEME : TH: 00; TU: 00; PR: 04(CLOCK HRS.)
TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE : NIL
PR. TEE : 02 HRS (Internal)
PT. : NIL

❖ RATIONALE:

Energy conservation is a scientific and basic tool to make balance in different forms of energies. This course imparts the awareness, knowledge and practical skills/ techniques of energy conservation in various sectors. After completion of this course diploma engineering students must use various techniques and methods of energy conservation. Also they should be able to perform energy audit and its implementation.

COURSE OUTCOMES:

After completing this course students will be able to–

1. Determine losses in Mechanical System
2. Use different methods of energy conservation
3. Collect information related to star rating equipment
4. Use energy conservation equipment for energy audit
5. Design efficient illumination scheme for energy conservation
6. Prepare energy audit report.

❖ COURSE DETAILS:

THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

A. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs
1.	Use different dynamometers and tachometer for measurement of power of rotating shaft.	Mechanical Measurement	4
2	Use RDT PT100 thermal sensor and its module for measurement of temperature at different stages in IC engine.		2
3	Use anemometer and measure quantity of air supplied to IC Engine.		2
4	Determine Volumetric and overall efficiency of two stage reciprocating compressor by conducting trial on test rig.	Mechanical Performance Measurement	4
5	Determine overall efficiency of centrifugal pump and plot operating characteristics by using centrifugal test rig.		4
6	Calculate coefficient of performance by conducting trial on vapour compression refrigeration test rig.		4
7	Collect performance information of 5 stars and 2 stars, same brand split AC and compare the results in terms of energy consumption.	Basic of Energy Conservation	2
8	Calculate electric bill for electric water heating system. Compare it with cost of solar water heating system and calculate payback period of solar water heating system.		2
9	Connect voltmeter, ammeter and wattmeter in electric circuit to measure voltage, current and power required for energy audit.		2
10	Determine losses of single phase Transformer at No load, Half load and Full load by conducting load test.		2
11	Use power guard meter for measurement of different electrical quantities		2
12	Calculate payback period of energy efficient motor. Compare losses of energy efficient motor with similar capacity conventional motor.	Energy Conservation Methods	4
13	Calculate energy saving by using energy efficient equipments like automatic Star – Delta starter for three phase induction motor		4
14	Calculate energy saving in lighting system by retrofitting tube lights with LED lamps. Also calculate payback period.		4
15	Measure illumination level of different places with the help of Digital Lux Meter		4
16	Design illumination Scheme for any one of the following by using energy efficient luminaries; a) Flat b) Bungalow c) Independent House		4
17	Mini project Prepare Energy audit report of any institute/Industry/Hospital/Residence/small workshop.		4

18	Prepare report on visit to cogeneration system.		4
19	Prepare detail report and give presentation in the class on any one of the following topics , i) Energy conservation and Environmental issues ii) Market survey on energy efficient luminaries iii) Market survey on energy efficient motors and transformers. iv) Energy tariff system in India v) Energy conservation equipments vi) Energy Management vii) Energy Audit viii) Energy conservation act 2003		4
Skill Assessment			2
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable



❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipments, writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	3	-	3	3	-	3	-	3	-	-
2	-	-	3	-	3	3	-	3	-	3	-	-
3	-	-	-	-	-	3	-	3	3	3	-	-
4	-	-	3	2	3	-	-	3	3	3	-	-
5	-	-	3	-	-	-	-	3	-	3	-	-
6	-	-	3	-	3	3	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Generation and Utilization of Electrical Energy	D.Srilatha S.Sivnagraju M.Balasubbareddy Pearson , New Delhi	8131798771, 9788131798775
2.	India – The Energy Sector	P.H. Hederson, University Press,	
3.	Energy management Handbook	W.CTurner, Wiley Press	10: 142008870X
4.	Efficient Use and management of electricity in industry.	B.G. Desai, J.S.Rana, A.V. Dinesh, R. Paraman, Devki Energy Consultancy PVT Ltd	
5.	Renewable Energy Technologies- A Practical guide for beginners	Chetan Singh Solanki, Prentice-Hall of India PVT. Ltd., First, 2008.	978-81-203-3434-2
6	Chetan Singh Solanki, Prentice-Hall of India PVT. Ltd., First, 2008.	Renewable Energy Technologies- A Practical guide for beginners	-978-81-203-3434-2-

7	Non-Conventional Energy Resources	D.S.Chauhan, S.K.Srivastava, New Age International (P) Ltd. Publishers, Second 2011.	13:978-81-224-1768-5
8	Renewable Energy Sources & Conversion Technology	N.K. Bansal, Kleemann, Meliss	0074600230, 9780074600238.
9	Illuminating Engineering	Kamlesh Roy, Laxmi Publication, 2006	9789380386553

❖ **E-REFERENCES:**

1. www.bee.india.nic.in , accessed on 11th November, 2016
2. www.mnes.nic.in , accessed on 11th November, 2016
3. www.energymanagertraining.com , accessed on 11th November, 2016
4. www.greenbusiness.com , accessed on 11th November, 2016
5. www.worldenergy.com , accessed on 11th November, 2016
6. www.mahaurja.com , accessed on 11th November, 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Lux meter
2. Ammeter MI 0-5-10 A
3. Voltmeter MI 0-150-300 V
4. Wattmeter 0-3000 W
5. Digital Multi-meter
6. Rheostat assorted sizes
7. PV Solar panel
8. Energy efficient motors
9. Energy efficient transformer
10. Energy efficient luminaries
11. Energy efficient Equipments /Devices
12. Power Guard Meter (For measurement of V, I, W, VA, PF, KWh)

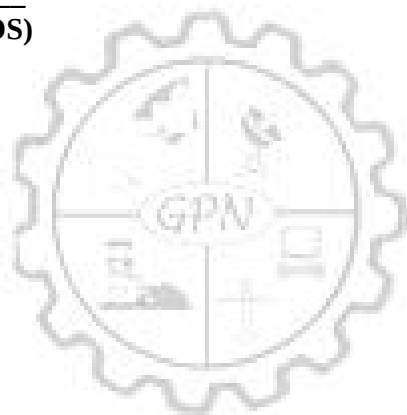
❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C.S.Thorat	Principal	Government Polytechnic, Nagpur.
2.	Mr. O. V. Sarode	I/C, Head of Mechanical Engineering	Government Polytechnic, Nagpur
3.	Mrs. K.M.Gaidhane	I/C, Head of Electrical Engineering	Government Polytechnic, Nagpur.
4.	Mr. A.R. Shaikh	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.

4.	Mrs.S.P.Thote	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
5.	Dr. R.S.Surjuse	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
6	Mr.G.V.Gotmare	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
7	Mr.N.H.Adikine	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
8	Bhashkar Bale	Dy. Executive Engineer,	MSTCL, Nagpur
9	R.Y.Ghormade	Head of Electrical Engineering	Dharampeth Polytechnic, Nagpur
10	DR. S.S.Bharatkar	Lecturer in Electrical Engineering	Government Polytechnic, Amaravati.

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/AE/PK/MT/EC/IT/CM /TX/TR
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: FE512E
COURSE TITLE	: LEARNING ABILITY DEVELOPMENT
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT =2CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT.	: NIL

❖ RATIONALE:

Learning ability of an engineer or professional is essential through the level at which he/she has developed and persuades his/her hobby. It enhances the creativity. Hobby is integral and important part of human personality. Hobby is best for recreation which rejuvenates a person. To obtain maximum benefits from hobby the overall understanding and competency in performance is utmost important.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Develop learning ability through hobby.
2. Appreciate importance of hobby in developing learning ability.
3. Choose related equipments, consumables and gears.
4. Maintain related equipments.
5. Carry out setting of equipment.
6. Exhibit learning through performance.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Present following: Learning ability development through hobby.	Introduction	4
2	Collect information about present scenario of related field – Experts in India, Experts in your city	Awareness Development	4
3	Demonstrate different related equipments.	Demonstration	4
4	Demonstrate Performance.		4
5	Practice setting up related instruments	Practice	4
6	Practice performance –level I		20
7	Practice performance –level II		16
8	Practice tuning and preliminary maintenance of related instruments.		4
Skill Assessment			4
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics & Printouts	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Practical on setting up / tuning related instruments	10
2	Performance –level I	20
3	Performance –level II	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	-	-	-	-	-	-	-	-	3	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	3	3	-	3	-	3	3	3	-	-
4	-	-	3	3	-	3	-	3	3	3	-	-
5	-	-	3	3	-	3	-	3	3	3	-	-
6	-	-	3	3	-	-	-	3	3	3	-	-

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
NIL			

❖ **E-REFERENCES:**

- ❖ <https://en.wikipedia.org/wiki/Hobby>
- ❖ www.justdial.com/Nagpur/Hobby
- ❖ nagpur.quikr.com

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

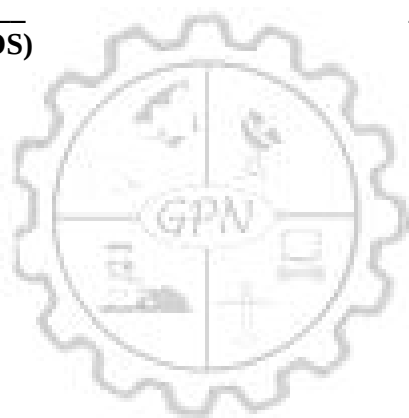
- ❖ As per requirement of related field.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C.S.Thorat	Principal	Government Polytechnic, Nagpur.
2.	Dr. K.S.Dixit	Head of Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr. S.A.Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr. R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
5.	Mr. J.M.Syed	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



Vision of the Civil Engineering Program

To impart knowledge and excellence in civil engineering and technology with global perspectives to our students and to make them ethically strong engineers to build our nation.

Mission of the Civil Engineering Program

- M1 :** To produce civil engineers of high caliber, technical skills and ethical values to serve the Society and nation.
- M2 :** To create competent professionals who are trained in the design, estimate, and development of civil engineering systems.
- M3 :** To promote innovative and original thinking in the minds of budding engineers to face the challenges of future.
- M4 :** To provide essential knowledge & skill to the students and enhance their employable potential and entrepreneurial capabilities.

Program Educational Objectives - PEOs

- PEO1** : To create civil engineering professionals ready for industry, government or other Organizations by implementing efficient civil engineering practices.
- PEO2** : To make use of formal and informal learning opportunities to sustain and improve technical, personal and professional growth and get various licensure
- PEO3** : To develop professional skills and by using modern tools in civil engineering
- PEO4** : To relate broad civil engineering education for effective communication of civil engineering concepts orally and in written forms.
- PEO5** : To guide principles of sustainable development and to promote the students for continuous learning and development with professional moral and ethical values.

Program Specific Outcomes - PSOs

- PSO1** : Construct, and maintain roads, bridges, irrigation structures and buildings.
- PSO2** : Use appropriate techniques to test the civil engineering materials.

Program Outcomes

- PO1 : Basic Knowledge:** Ability to apply knowledge of basic Mathematics, Science and Engineering to solve the engineering problems.
- PO2 : Discipline Knowledge:** Ability to discipline specific knowledge to solve core and/or applied engineering problems.
- PO3 : Experiments and Practice:** Ability to plan and perform experiments and practices and use the results to solve engineering problems.
- PO4 : Engineering Tools:** Apply appropriate technologies and tools with understandings of limitations.
- PO5 : The Engineer and Society:** Demonstrate knowledge to assess the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.
- PO6 : Environment and Sustainability:** Understand the impact of engineering solutions in societal and environmental context, and demonstrate knowledge and need for sustainable development.
- PO7 : Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- PO8 : Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.
- PO9 : Communication:** An ability to communicate effectively.
- PO10: Life-long learning:** Recognise the need for, and have preparation and the ability to engage in independent and life-long learning in context of technological changes.



GOVERNMENT POLYTECHNIC

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