

OUTCOME BASED CURRICULUM 2016

Program Diploma in Automobile Engineering



**Government Polytechnic,
Nagpur**

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

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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 Automobile
Engineering



by

Curriculum Development Cell,

Government Polytechnic, Nagpur

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And

Board of Studies (BOS),

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Accepted by

Governing Board (GB),

Government Polytechnic, Nagpur

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Government Polytechnic, Nagpur

(An Autonomous Institute of Government of Maharashtra)

OUTCOME BASED CURRICULUM-2016

DIPLOMA IN AUTOMOBILE ENGINEERING

The Program Structure and Curriculum Contents for Diploma in Automobile Engineering are approved in Advisory Board (AB), Programwise Board of Studies (PBOS), Board of Studies (BOS), And Governing Board (GB), Government Polytechnic, Nagpur.

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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	Course Outcomes (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 Mission and PEOs	58

8.8.3	Mapping of PEOs and POs- PSOs	59
8.9	Identified Skills in Search Conference	59
8.9.1	Technical skills for Automobile Engineering Diploma Students.....	59
8.9.2	Generic skills for Automobile Engineering Diploma Holder	62
8.10	2011 Curriculum Mapping with Program Outcomes (POs).....	62
8.10.1	Identified Gaps in 2011 Curriculum.....	65
8.11	Courses Identification	66
8.12	Program Structure	70
8.12.1	Program Structure Level I: General Studies	71
8.12.2	Program Structure Level II: Basic Science Courses	72
8.12.3	Program Structure Level III: Engineering Sciences and Technical Arts Courses	73
8.12.4	Program Structure Level IV: Professional Courses	74
8.12.5	Program Structure Level IV: Professional Courses (Project Courses)	75
8.12.6	Program Structure Level V: Elective Courses	76
8.12.7	Program Structure Level V: Elective Courses	77
8.12.8	Program Structure Abstract.....	78
8.13	Award of Class Courses	79
8.14	Curriculum at a Glance	80
8.15	Course Flow Diagram	81
APPENDIX A CURRICULUM.....		82

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. Course Flow Diagram.....	81

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.....	58
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	71
Table 8.7. Program Structure Level II: Basic Science Courses	72
Table 8.8. Program Structure Level III: Engineering Sciences and Technical Arts Courses	73
Table 8.9. Program Structure Level IV: Professional Courses.....	74
Table 8.10. Program Structure Level IV: Professional Courses (Project Courses)	75
Table 8.11. Program Structure Level V: Elective Courses.....	76
Table 8.12. Program Structure Level V: Elective Courses.....	77
Table 8.13. Program Structure Abstract	78

Table 8.14. Award of Class Courses.....	79
Table 8.15. Curriculum at a Glance	80

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.

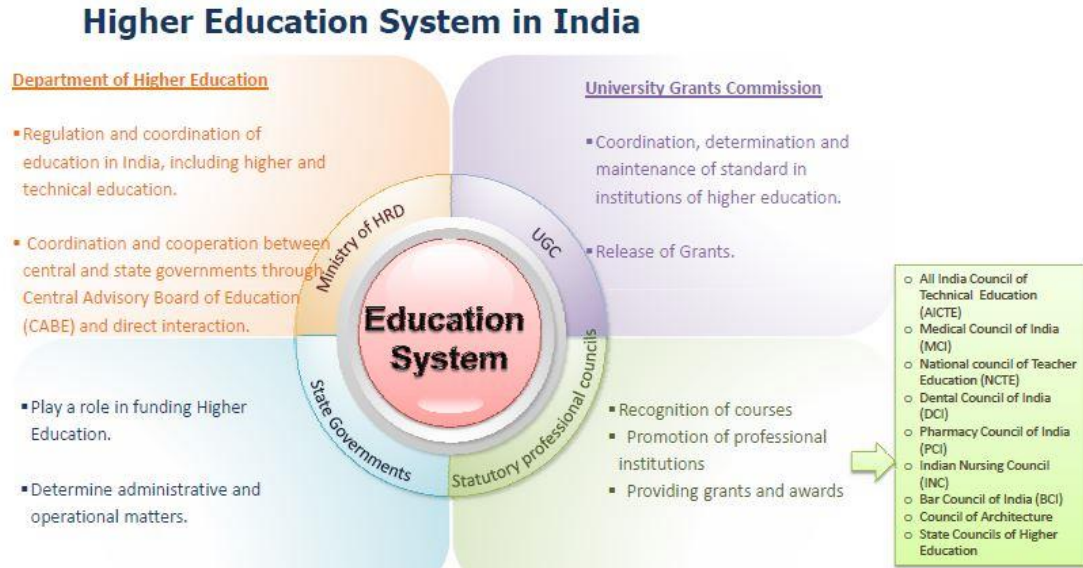


Figure 2.1. Higher Education System in India

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

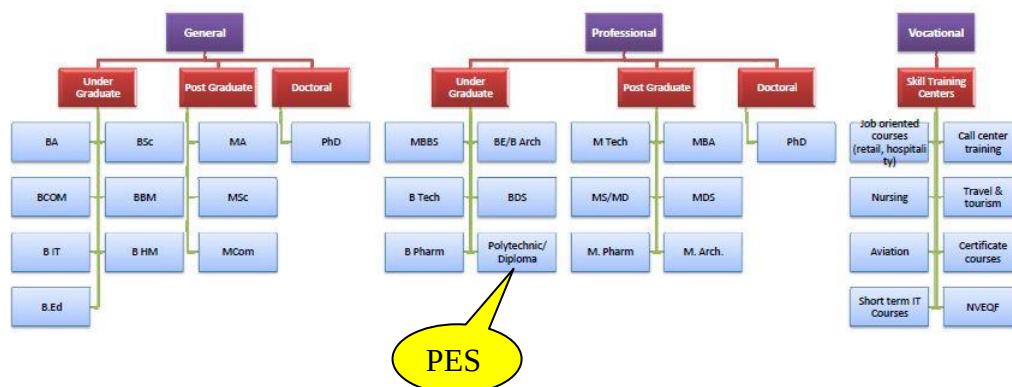


Figure 2.2. Classification of Higher Education System in India

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.

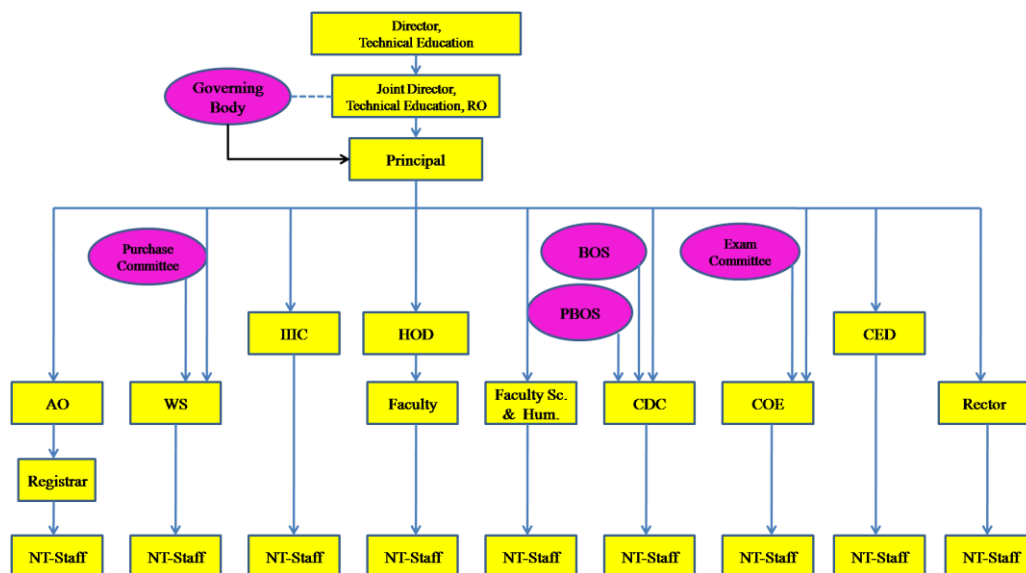


Figure 3.1. Organizational Structure of GPN

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.

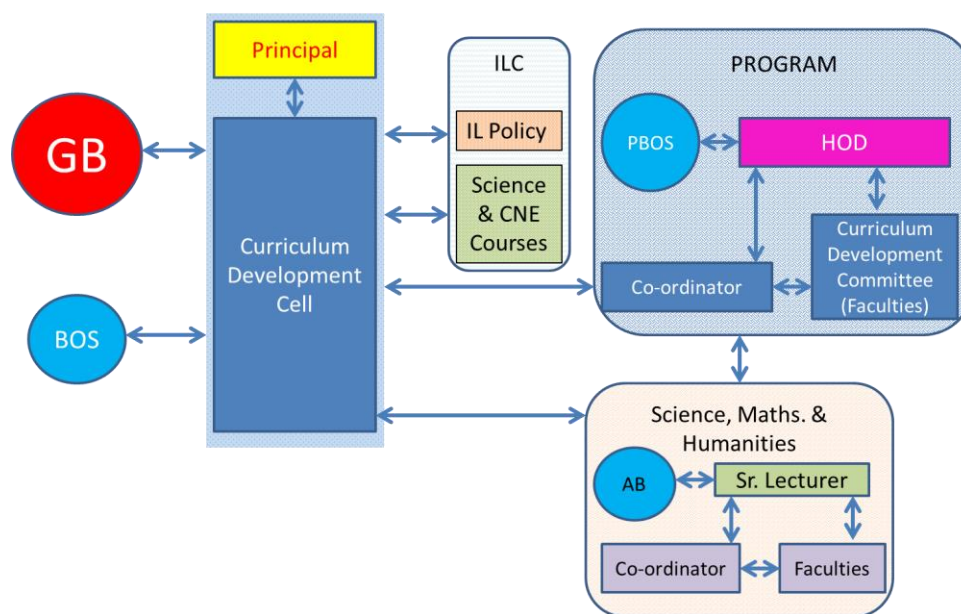


Figure 3.2. Curriculum Development System

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 AB 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?

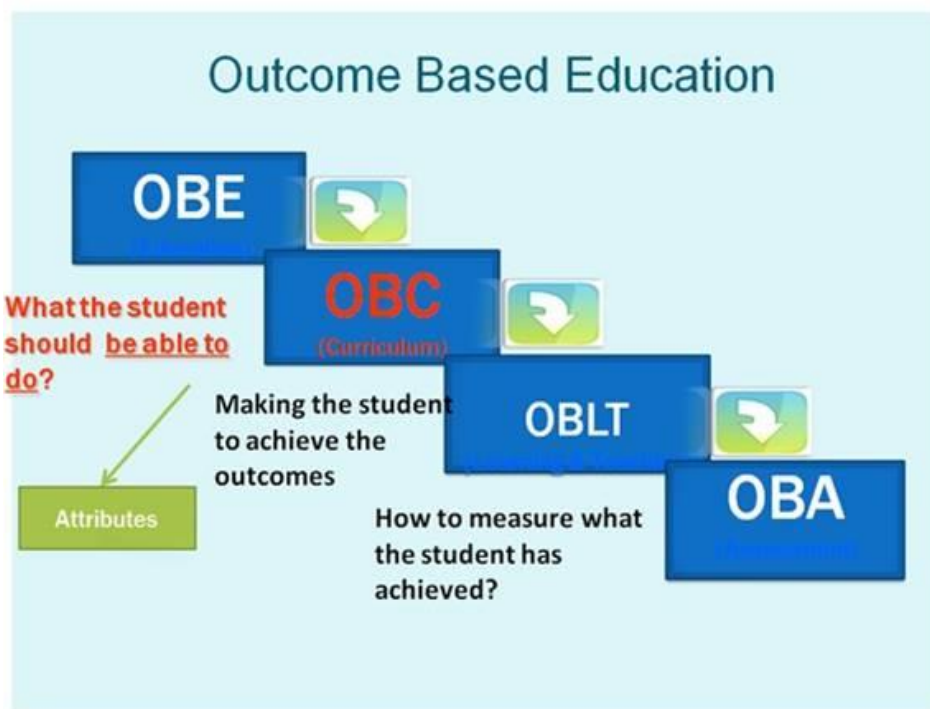


Figure 4.1. Outcome Based Education Framework

4.2 KEY constituents of OBE

Figure 4.2 shows the key constituent of OBE.

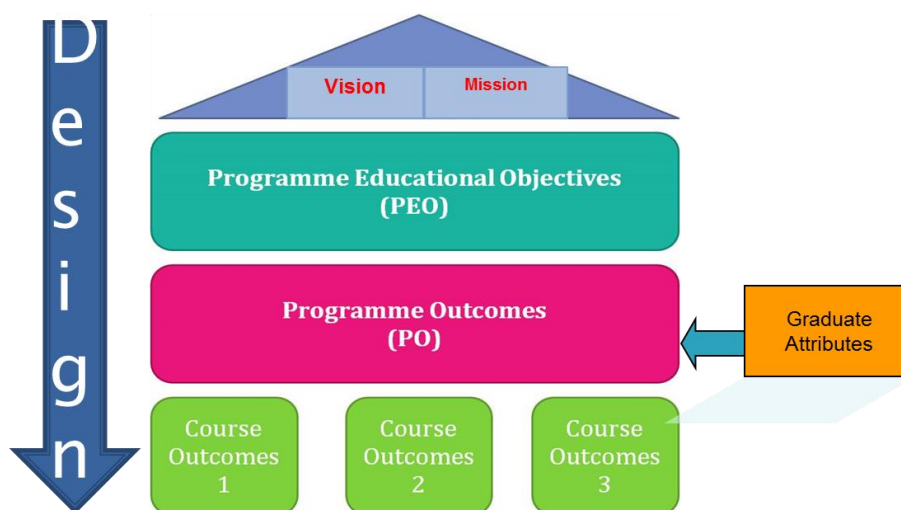


Figure 4.2. Key Constituents of OBE

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.

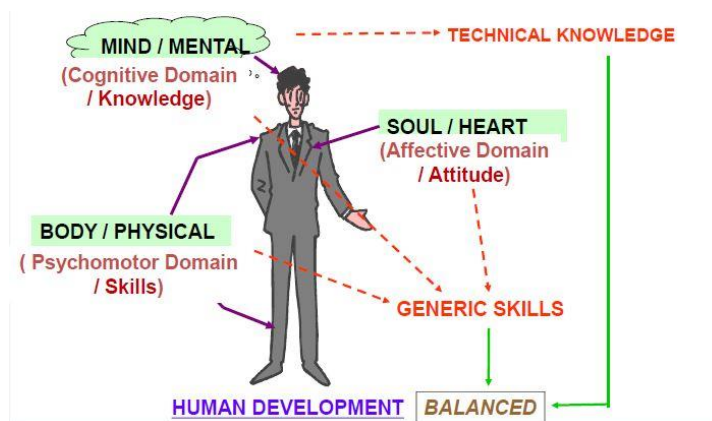


Figure 5.1. Human Being and Domains of Learning

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.

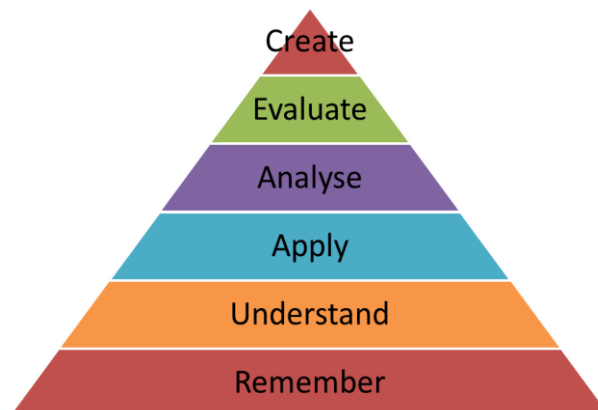


Figure 5.2. Revised cognitive hierarchy Levels

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.

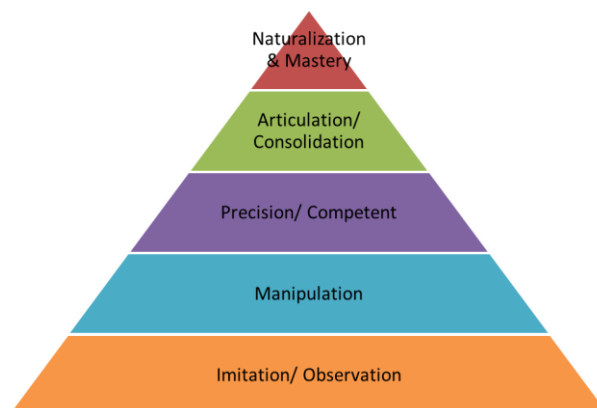


Figure 5.3. Psychomotor hierarchy Levels

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.

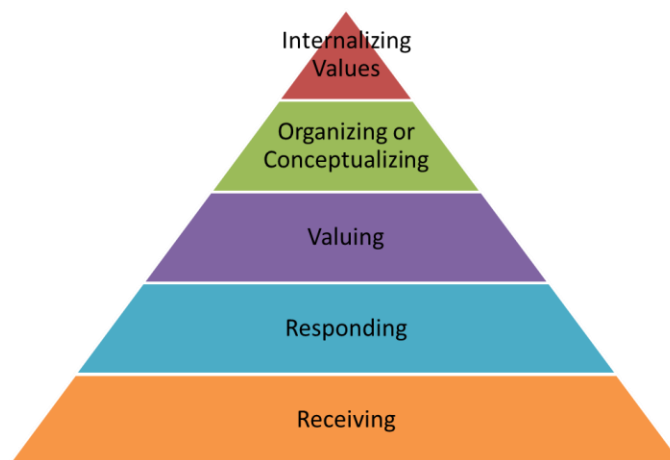


Figure 5.4. Affective Domain hierarchy Levels

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

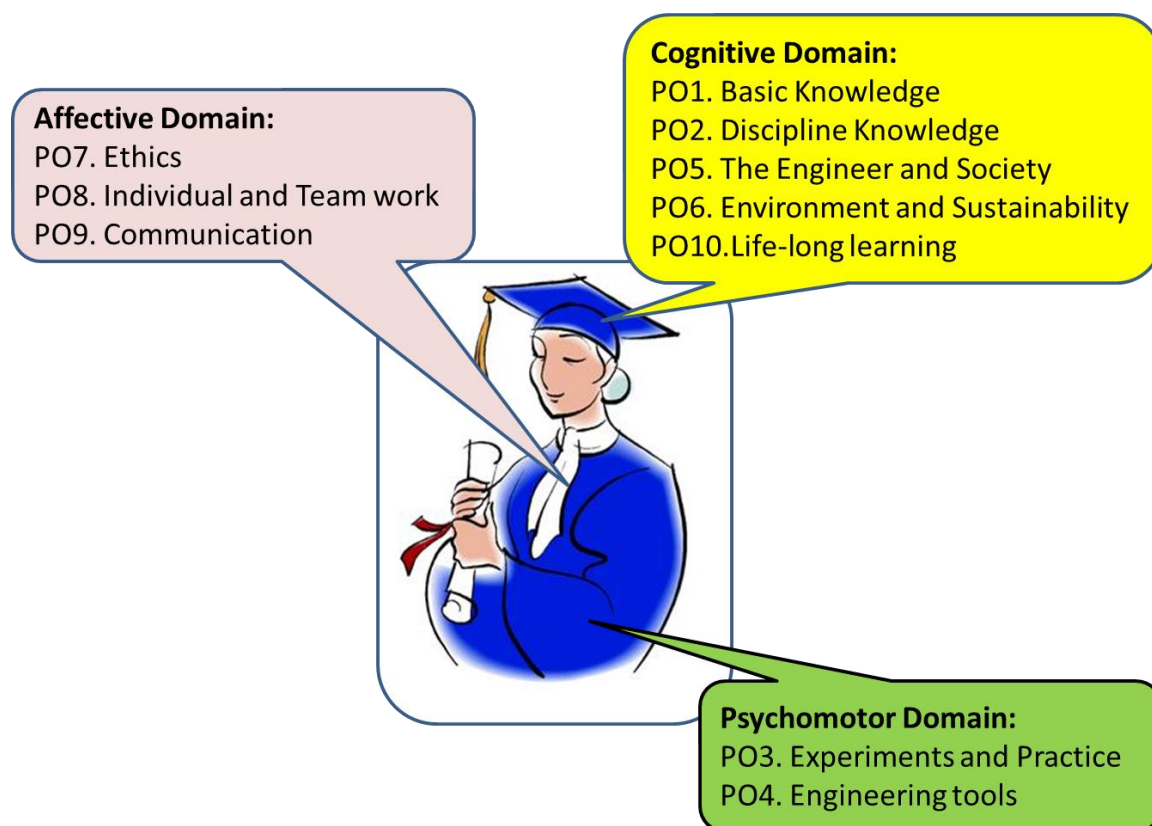


Figure 5.5. Program Outcomes and Domains of Learning

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.

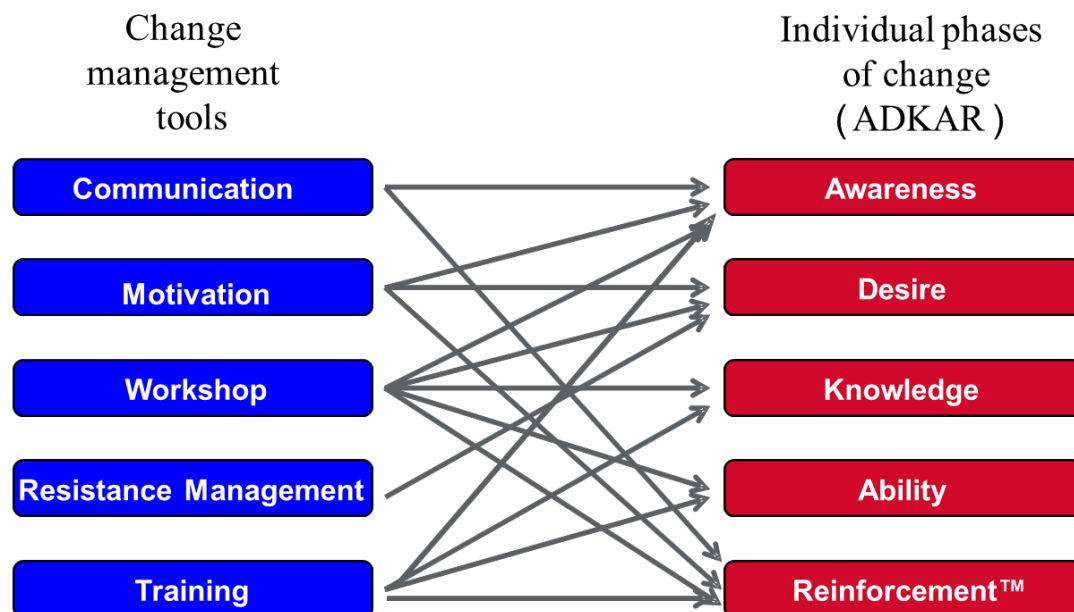


Figure 6.1. Mapping of change management tools with ADKAR

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, Ahmadabad (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

SN	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 weight age
- 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)

SN	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	Maintain Electrical Equipment's	Maintain Electrical Power System
1	EV1101	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 Branch)

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 Th Hr = 1Credit & 2 Pr Hr = 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 360⁰ approach model. Based on this 360⁰ CDC developed our own model based on the study described above. Government Polytechnic, Nagpur model is named as GoPoNa Model. The model is as shown in figure 6.2.

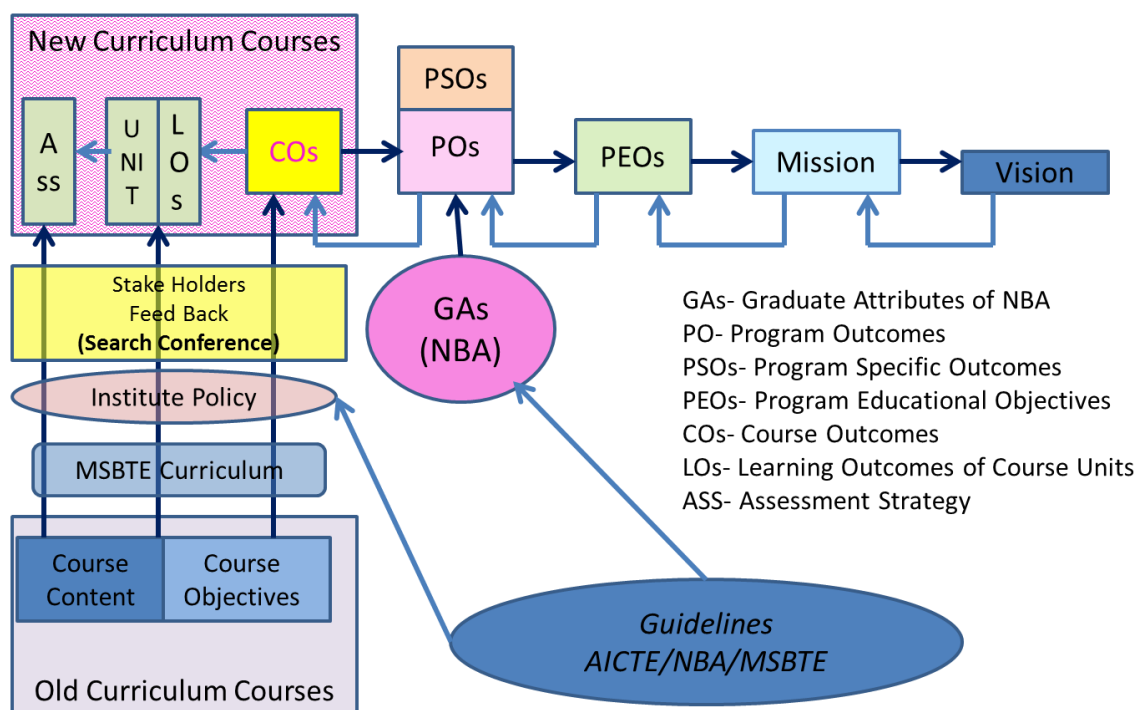


Figure 6.2. GoPoNa Model

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 360⁰ 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, up to
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 (Described in chapter 7) and draft curriculum of Basic Electrical Engineering is developed (shown in table 6.16) 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 GB 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.

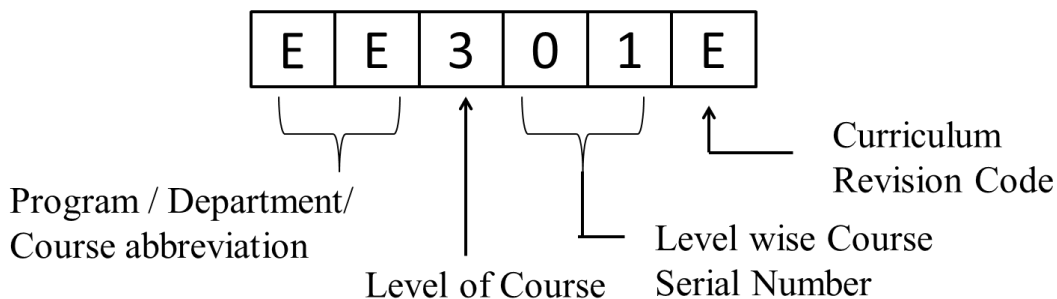


Figure 7.1. Course Code

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 **Automobile 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 Automobile Engineering Program:

Lead in Imparting Education in Automobile Engineering.

8.4 Mission of Program

Mission of the Automobile Engineering Program:

- M1: To develop industry ready students also maintain the scope for vertical mobility.
- M2: To inculcate innovative and problem solving approach towards the work.
- M3: To develop globally acceptable students who can implement modern technology.
- M4: To develop lifelong learning ability with ethical, societal and environmental protection.

8.5 Program Educational Objectives (PEOs)

PEO:1 To develop diploma pass out students with sound mathematical, scientific and engineering fundamentals.

PEO:2 To develop an ability in the students to identify, formulate and solve engineering problems based on design, developments and its result analysis.

PEO:3 To equip students with modern engineering tools, skills and practices to get ready made input to the industry.

PEO:4 To develop an ability in student to work in teams in different projects across the globe with effective engineering as well as interpersonal communication.

PEO:5 To provide students with learning environment awareness to the lifelong learning needed to professional growth with ethical responsibilities.

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: Maintain the vehicles.

PSO2: Apply knowledge of manufacturing process drawing, design and automobile technology for automobile manufacturing industry.

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 Automobile Engineering Diploma Students

1.	Identify the parts of subassemblies and assemblies of various systems.
2	Select suitable drives and mechanisms for the different applications.
3.	Identify & Select the appropriate auto workshop tools/ equipments to dismantle and assemble the components.
4	Dismantle and Assemble the various automobile system components.
5	Specify and compare the different types of automobile bodies.
6.	Perform the different milling operations for the different jobs
7	Analyze and apply the various surface cleaning and coating processes.
8	Operate the press to perform the different operations.
9.	Analyze the forces and stresses acting on the different elements.
10	Use design data book
11	Design various general machine parts.
12	Select the IC engines as per requirements.
13	Operate and maintain the engines.
14	Identify the various parts.
15	Dismantle and assemble the systems of engines.
16	Test the MPFI system and DFI system.

17	Perform diagnosis using diagnostic tester/ engine scanner.
18	Check pollutants emitted from S.I. and C.I. engines.
19	Identify the alternator and starter motor components.
20	Perform the tests for battery, alternater, starter motor and distributor.
21	Diagnose and repair the defects in the circuits.
22	Draw a layout of service stations for LMV/Cars. Fill the information (mock)in job card & warranty documents.
23	Records the service documents. Prepare a detail project report for establishing a dealership and prepare a case for financing a four wheeler.
24	Describe hydraulics/Pneumatics principles, properties of fluids.
25	Construct hydraulics/ Pneumatics circuits.
26	Verify Bernoulli's theorem.
27	Calculate coefficient of discharge.
28	Diagnose, Find failure causes of hydraulics/Pneumatics components.
29	Get acquainted with the MV Act and taxation. Fill up the different forms of RTO. Run the business of buying and selling the vehicles. Modify/ Prepare the documents required for transport organizations.
30	Interpret the industrial drawings. Prepare the assembly and details drawing.
31	Draw, edit & modify 2D/3D drawing. Use of different commands. Export-import files.
32	Identify the road signals and signs.
33	Perform the test driving.
34	Use defensive driving practices.
35	Operate various vehicle controls such as clutch. Gears, brakes etc.
36	Determine velocity and acceleration of various links, slip and length of belt, angle of contact in belt drive, power transmitted by belt drive.
37	Plan and prepare the maintenance Schedule. Detect, rectify the faults.
38	Select the project & Plan the Design.
39	Fabricate and test the project.

40	Coordinate the group.
41	Prepare project report. Present the project work.
42	Select the seminar and discuss the topic.
43	Planning and Analysis the topic.
44	Prepare the seminar report.
45	Present/ deliver the seminar.
46	Get acquainted with industrial safety practices.
47	Carry out survey related to industrial processes. Identify the industrial problems.
48	Prepare and present industrial training report.
49	Identify and locate And testing the sensors.
50	Diagnosis the Engine system (OBD).
51	Rebuild of Electronic Clutch.
52	Drawing sketches of air flow pattern.
53	Calculate and measure aerodynamic forces.
54	Testing of vehicle shapes in wind tunnel.
55	2D and 3D drafting and 3D modeling.
56	Part programming.
57	Identify various parts of Air conditioning System.
58	Dismantling and assembling the Air conditioning System.
59	Diagnosis and repair of Air conditioning System.
60	Selection of appropriate machine with respective to application.
61	Identify system and sub system of earth moving machine.
62	Carry out preventive maintenance and minor problems.
63	Testing of various fuels and its Blending process.
64	To get acquainted with the industrial work culture.
65	To get acquainted with Human Resource Development Activities in Industries.
66	To get acquainted with the activities of Marketing Management.
67	To get acquainted with Basics & financial Management.

68	To get acquainted with industrial acts.
69	To get acquainted with auditing in Management
70	To present sample case studies of natural disasters
71	To prepare reports on various issues related to environmental pollution
72	Develop energy generation project, Guide about energy conservation ,advice about saniterisation
73	Demonstrate the use of internet ,provide materials
74	On agriculture technique, try solve their problems, aware them about the new banking technique, report writing.

8.9.2 Generic skills for Automobile Engineering Diploma Holder

1	Learn skills to develop personal traits.
2	Expand the area of learning beyond communication.
3.	Draw motivation from various sources.
4.	Learn to draft technical letters.

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	Maintain the vehicle	Apply knowledge of manufacturing process
EN1101	English	X	-	X	-	-	-	-	X	X	X	-	-
IT1102	Engg. Physics	X	-	X	X	-	-	-	X	X	X	-	-
PH1201	Basics of Information systems	X	-	X	X	-	-	-	X	-	X	-	-
MH1201	Basic Engg. Mathematics	X	-	X	-	-	-	-	X	-	X	-	-
ME1301	Bicycling Science	X	X	X	X	-	-	X	X	X	X	-	-
WS1301	Engg. Graphics	X	-	X	X	-	-	X	X	X	X	X	X
AE1401	Engg.	X	X	X	-	X	-	-	X	X	X	X	X
AE1101	History of Automobiles	X	X	X	-	X	X	-	-	X	X	X	X
EN1102	Communication Skills	X	-	X	-	-	-	-	X	X	X	-	-
MH1202	Engg. Mathematics	X	-	X	-	-	-	-	X	-	X	-	-
CH1201	Engg. Chemistry	X	-	X	-	-	-	-	X		X	-	-
AM1301	Engineering Drawing	X	X	X	X	-	-	-	X		X	-	-
ME1302	Engg. Mechanics	-	X	X	X	-	-	X	-	X	X	X	X
MH1203	Applied Mathematics	X	-	X	-	-	-	-	-	-	X	-	-
AE1302	Mechanics of Thermal Systems	X	X	X	X	-	X	-	-	-	X	X	X
AE1304	Theory of Auto Mechanisms	X	X	X	X	-	-	X	-	X	X	X	X
AM1307	Strength of Materials	X	X	X	X	-	-	-	-	-	X	X	X

AE1409	Automobile Manufacturing Processes	-	X	X	X	-	X	-	-	-	X	-	X
AE1411	Automobile Maintenance	-	X	-	-	X	X	X	X	X	X	X	-
AE1502	Project	-	X	X	X	X	X	X	X	X	X	X	X
AE1503	Vehicle Driving Practice	-	X	X	-	X	X	X	-	-	X	X	X
AE1506	Automobile Infotronics	-	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:

Computer Added Drafting

Automobile Aerodynamics (Elective)

CAD/CAM

Hydraulics and Pneumatics

Alternative Fuel System (Elective)

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	COURSE	CODE
To lay a strong foundation of English through grammar. To teach correct structure of word and sentences	English	EN101E
To acquire skills to learn efficiently. To enable the students to have broader vision. To face problems with confidence.	Communication skills	EN102E
To get acquainted with the industrial work culture. To get acquainted with Human Resource Development Activities in Industries. To get acquainted with the activities of Marketing Management. To get acquainted with Basics & financial Management. To get acquainted with industrial acts. To get acquainted with auditing in Management	Industrial Organization and management	MN101E
To present sample case studies of natural disasters To prepare reports on various issues related to environmental pollution	Environment Science	EV101E
Develop energy generation project, Guide about energy conservation ,advice about saniterisation demonstrate the use of internet ,provide materials On agriculture technique, try solve their problems, aware them about the new banking technique, report writing.	Rural Development	RD101E
Effective use of office tools for preparing documents ,worksheet & presentation Effective Use of internet facilities.	Computer Application	CA201E
lect proper measuring instruments on the basis of range and its least count. Calibrate different measuring instrument. Transform one unit from one system to another system of unit. Test physical properties for practical application.	Engineering Physics	PH201E

Verify the principal and laws.		
Develop analytical skills for various analysis Analyze the water sample (Acidity, alkalinity , hardness ,PH value) Find the percentage of iron in given ferrous alloy Prepare Bakelite plastic. Compare rate of corrosion	Applied Chemistry	CH202E
To calculate the unknown quantities derive, prove the mathematical expression	Engineering Mathematics	MH201E
To develop logical thinking which is useful in comprehending the principles of all other subjects.	Applied Mathematics	MH203E
Drawing of various objects Judgment of object	Automobile Engineering Graphics	AE301E
Handling different machines Operating different M/Cs Setting of Job Marking for preparation of job	Workshop Practice	WS301E
Calculating stress ,strain, identify Beam structure, specify the different forces, mention different trusses	Engineering Mechanics	AM301E
Describe laws , theorem. Utilization of laws & theorem Connection of different components, Perform with Precautionary measure, Calculate ,elaborate, Interpret, Specify different components Select particular component Draw circuit diagram, phasor dia Analyze , Identify Handling of different meters	Basics of Electrical System	EE305E
Specify different components Select particular component Connection of different components Analyze , Measure values, Draw circuit diagram State functions of different part of circuit Identify the terminals, Handling of multimeter	Electronics systems for Automobile	EC306E
Identify materials required for automotive parts. Identify various heat treatment process. Perform different manufacturing operation.	Material And Manufacturing Process	AE302E
Use of Steam Tables and Mollier Chart, psychometric Charts Handle measuring instrument.	Thermal Engineering	ME303E
Identify the components of transmission system. Compare the various vehicle layouts and different	Automobile	AE401E

chassis. Dismantle and Assemble the automobile transmission components.	Transmission System	
Draw shear force, bending moment, bending stress and shear stress diagrams. Record the readings and behavior of material till fracture and analyze its failure. Operate the universal testing machine and compression testing machine.	Strength of Materials	AM307E
Draw the profile of a radial cam to obtain the desired follower motion. Select suitable drives and mechanisms for the different applications. Determine velocity and acceleration of various links, slip and length of belt, angle of contact in belt drive, power transmitted by belt drive.	Theory of Machines	AE402E
Specify and compare the different types of automobile bodies. Identify the parts of subassemblies and assemblies of various systems. Dismantle and Assemble the various automobile system components.	vehicular Systems & Body	AE403E
Perform the different machining operations for the different jobs. Analyze and apply the various surface cleaning and coating processes. Operate the press to perform the different operations.	Automobile Manufacturing Process	AE404E
Analyze the forces and stresses acting on the different elements. Use design data book, and Design various general machine parts.	Design of Automobile Components	AE405E
Select the IC engines as per requirements. Operate and maintain the engines. Identify the various parts. Dismantle and assemble the systems of engines.	Automobile Engines	AE406E
Test the MPFI system and DFI system. Perform diagnosis using diagnostic tester/ engine scanner. Check pollutants emitted from S.I. and C.I. engines.	Advance Automobile Engines	AE407E
Identify the alternator and starter motor components.	Automobile Electrical & Electronics	AE408E

Perform the tests for battery, alternator, starter motor and distributor. Diagnose and repair the defects in the circuits.		
Draw a layout of service stations for LMV/Cars. Fill the information (mock)in job card & warranty documents. Records the service documents. Prepare a detail project report for establishing a dealership and prepare a case for financing a four wheeler.	Automobile Service Management	AE409E
Describe hydraulics/Pneumatics principles, properties of fluids. Construct hydraulics/ Pneumatics circuits. Verify Bernoulli's theorem. Calculate coefficient of discharge. Diagnose, Find failure causes of hydraulics/Pneumatics components.	Hydraulics & Pneumatics	AE410E
Get acquainted with the MV Act and taxation. Fill up the different forms of RTO. Run the business of buying and selling the vehicles. Modify/ Prepare the documents required for transport organizations.	Transport Management	AE411E
Interpret the industrial drawings. Use IS conventions, limit, fit, tolerances. Prepare the assembly and details drawing.	Automobile Engineering Drawing	AE412E
Draw, edit & modify 2D/3D drawing. Use of different commands in different tools. Export-import files. Plot drawings on A2/A3 size sheets.	Computer Aided Drafting	AE413E
Identify the road signals and signs. Perform the test driving. Use defensive driving practices. Operate various vehicle controls such as clutch, Gears, brakes etc.	Vehicle Driving Practice	AE414E
Identify & Select the appropriate auto workshop tools/ equipments to dismantle and assemble the components. Plan and prepare the maintenance Schedule. Detect, rectify the faults.	Automobile Service Practice	AE415E
Select the project & Plan accordingly. Fabricate and test the project. Coordinate the group. Prepare project report. Present the project work.	Project	AE416E
Select the seminar and discuss the topic. Planning and analysis the topic.	Seminar	AE417E

Prepare the seminar report. Present/ deliver the seminar.		
Get acquainted with industrial safety practices. Carry out survey related to industrial processes. Identify the industrial problems. Prepare and present industrial training report.	Industrial Practices/Industrial Training	AE418E
Identify and locate and testing the sensors and actuators Diagnosis the Engine system (OBD). Rebuild of Electronic Clutch.	Automobile Infotronics	AE501E
Drawing sketches of air flow pattern. Calculate and measure aerodynamic forces. Testing of vehicle shapes in wind tunnel.	Automobile Aerodynamics	AE502E
2D and 3D drafting. 3D modeling. Part programming.	CAD/CAM	AE503E
Identify various parts of Air conditioning System. Dismantling and assembling the Air conditioning System. Diagnosis and repair of Air conditioning System.	Automobile Air conditioning System	AE504E
Selection of appropriate machine with respective to application. Identify system and sub system of earth moving machine. Carry out preventive maintenance and solve minor stoppages.	Earth Moving Machines	AE505E
Testing of various fuels. Blending process.	Alternative fuel system.	AE506E
Identify various system of two/four wheeler. Handling of different tools. Motor vehicle rule and road signal. Able to perform primary maintenance.	Two and four wheeler technology	FE510E
Develop learning ability through hobby. Handling and maintenance of the different instruments	Learning Ability Development	FE512E

8.12 Program Structure

The program structure of the Automobile 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 AUTOMOBILE 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 Management	Min.50 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 Representations:

** 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 AUTOMOBILE 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 Applications	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	CH201E	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

Level III: Engineering Sciences and Technical Arts Courses

DIPLOMA IN AUTOMOBILE 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	AE301E	Automobile Engineering Graphics	NIL	4	0	4	6	70	30	NIL	25	125
2	WS301E	Workshop Practice	NIL	0	0	4	2	NIL	NIL	NIL	50	50
3	AM301E	Engineering Mechanics	NIL	3	1	2	5	70	30	50 [@]	25	175
4	EE305E	Basics of Electrical System	NIL	3	0	2	4	70	30	50 [@]	25	175
5	EC306E	Electronics System for Automobile	NIL	3	0	2	4	70	30	50 [@]	25	175
6	AE302E	Materials & Manufacturing Processes	NIL	4	0	2	5	70	30	50 [#]	25	175
7	ME303E	Thermal Engineering	NIL	4	0	0	4	70	30	NIL	NIL	100
Total				21	1	16	30	420	180	200	175	975

8.12.4

Program Structure Level IV: Professional Courses

Table 8.9. Program Structure Level IV: Professional Courses

DIPLOMA IN AUTOMOBILE 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	AE401E	Automobile Transmission System ^{\$}	NIL	3	0	2	4	70	30	50 [#]	25	175
2	AM407E	Strength of Materials	AM301E	3	1	2	5	70	30	50 [@]	25	175
3	AE402E	Theory of Machine	NIL	3	0	2	4	70	30	50 [@]	25	175
4	AE403E	Vehicular System & Body Engineering ^{\$}	NIL	4	0	2	5	70	30	50 [#]	25	175
5	AE404E	Automobile Manufacturing Process ^{\$}	NIL	3	0	2	4	70	30	50 [#]	25	175
6	AE405E	Design Of Automobile Components ^{\$}	NIL	4	0	2	5	70	30	50 [#]	25	175
7	AE406E	Automobile Engine	NIL	3	0	2	4	70	30	50 [@]	25	175
8	AE407E	Advance Automobile Engine ^{\$}	NIL	4	0	2	5	70	30	50 [#]	25	175
9	AE408E	Automobile Electrical & Electronics ^{\$}	NIL	4	0	2	5	70 ^{**}	30	50 [#]	25	175
10	AE409E	Automobile Service Management	NIL	4	0	2	5	70	30	50 [#]	25	175
11	AE410E	Hydraulics & ^{Pneumatics} ^{\$}	NIL	4	0	2	5	70	30	50 [#]	25	175
12	AE411E	Transport Management ^{\$}	NIL	3	0	2	4	70	30	50 [@]	25	175
13	AE412E	Automobile Engineering Drawing	AE301E	2	0	4	4	Nil	Nil	50 [#]	25	75
14	AE413E	Computer Aided Drafting	NIL	0	0	4	2	Nil	Nil	50 [@]	25	75
Sub Total (a)				44	1	32	61	840	360	700	350	2250

8.12.5

Program Structure Level IV: Professional Courses (Project Courses)

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

DIPLOMA IN AUTOMOBILE 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	AE414E	Vehicle Driving Practice ^{\$}	NIL	0	0	4	2	Nil	Nil	50 [#]	50	100
16	AE415E	Automobile Service Practice	NIL	1	0	4	3	Nil	Nil	50 [#]	50	100
17	AE416E	Project ^{\$}	100 credits	0	0	4	2	Nil	Nil	100 [#]	50	150
Sub Total (b)				1	0	12	7	Nil	Nil	200	150	350
c) Industrial Interaction courses												
18	SE401E	Seminar	60 credits	0	0	2	1	Nil	Nil	50 [@]	50	100
Any one from following												
19	ID401E	Industrial Training	70 credits	0	0	2	1	Nil	Nil	50 [@]	50	100
	ID402E	Industrial Practices		0	0	2	1	Nil	Nil	50 [@]	50	100
Sub Total (c)				0	0	4	2	Nil	Nil	100	100	200
Total (a) + (b) + (c)				45	1	48	70	840	360	1000	600	2800

8.12.6

Program Structure Level V: Elective Courses

Table 8.11. Program Structure Level V: Elective Courses

DIPLOMA IN AUTOMOBILE 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 (one from each group)												
Group 1												
1	AE501E	Automobile Infotronics ^s	NIL	3	0	2	4	70	30	50 [#]	25	175
1	AE502E	Automobile Aerodynamics ^s	NIL	3	0	2	4	70	30	50 [#]	25	175
Group 2												
2	AE503E	CAD/CAM ^s	NIL	3	0	2	4	70	30	50 [#]	25	175
2	AE504E	Automobile Air Conditioning System ^s	NIL	3	0	2	4	70	30	50 [#]	25	175
Group 3												
3	AE505E	Earth Moving Machine	NIL	3	0	2	4	70	30	50 [@]	25	175
3	AE506E	Alternative Fuel System	NIL	3	0	2	4	70	30	50 [@]	25	175
Sub Total (a)				9	0	6	12	210	90	150	75	525
b) Free Elective – Non-Technical												
1	FS501E	Finishing School	Min 60 Credit	0	0	4	2	Nil	Nil	50	25	75
Sub Total (b)				0	0	4	2	Nil	Nil	50	25	75
Total (a) + (b)				9	0	10	14	210	90	200	100	600

8.12.7

Program Structure Level V: Elective Courses

Table 8.12. Program Structure Level V: Elective Courses

DIPLOMA IN AUTOMOBILE 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 AE												
1	FE501E	Basic Building Drawings	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
2	FE502E	RAC Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
3	FE503E	Electrical Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
4	FE504E	Hobby Electronics	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
5	FE505E	Basic Packaging Technology	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
6	FE506E	Industrial Metallurgical Practices	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
7	FE507E	Computer Network	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
8	FE508E	PC Architecture & Maintenance	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
9	FE509E	Fabric Selection and Care	Nil	00	00	04	02	Nil	Nil	50 [@]	25	75
	FE510E	Two and 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 (c)				00	00	04	02	Nil	Nil	50	25	75
Total (a) + (b) + (c)				09	0	14	16	210	90	250	125	675

8.12.8 Program Structure Abstract

Table 8.13. Program Structure Abstract

Abstract

DIPLOMA IN AUTOMOBILE ENGINEERING												
Sr. No	Level	Course Title Prerequisite courses/credits	No of Courses	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	I	General Studies	5	11	01	06	15	280	120	150	75	625
2	II	Basic Science Courses	5	16	02	08	22	280	120	150	75	625
3	III	Engineering Sciences and Technical Arts Courses	7	21	01	16	30	420	180	200	175	975
4	IV	Professional Courses	19/20	45	01	48	70	840	360	1000	600	2800
5	V	Elective Courses	5/18	09	00	14	16	210	90	250	125	675
Total			41/55	102	05	92	153	2030	870	1750	1050	5700

Above program structure approved in PBOS meeting held on 12th April, 2016 for implementation from Academic session 2016-17.

8.13 Award of Class Courses

Table 8.14. Award of Class Courses

DIPLOMA IN AUTOMOBILE 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	AE401E	Automobile Transmission System	NIL	3	0	2	4	70	30	50#	25	175
2	AE403E	Vehicular System & Body Engg.	NIL	4	0	2	5	70	30	50#	25	175
3	AE404E	Automobile Manufacturing Process	NIL	3	0	2	4	70	30	50#	25	175
4	AE405E	Design Of Automobile Components	NIL	4	0	2	5	70	30	50#	25	175
5	AE407E	Advance Automobile Engine	NIL	4	0	2	5	70	30	50#	25	175
6	AE408E	Automobile Electrical & Electronics	NIL	4	0	2	5	70**	30	50#	25	175
7	AE415E	Automobile Service Management	NIL	4	0	2	5	70	30	50#	25	175
8	AE410E	Hydraulics & Pneumatics	NIL	4	0	2	5	70	30	50#	25	175
9	AE501E	Automobile Infotronics	NIL	3	0	2	4	70	30	50#	25	175
	AE502E	Automobile Aerodynamics	NIL									
10	AE503E	CAD/CAM	NIL	3	0	2	4	70	30	50#	25	175
	AE504E	Automobile Air Conditioning System	NIL									
11	AE414E	Vehicle Driving Practice	NIL	0	0	4	2	Nil	Nil	50#	50	100
12	AE416E	Project	100 credits	0	0	4	2	Nil	Nil	100#	50	150
Total				36	0	28	50	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
12	No. of Seminar Courses	2/3
13	Total Credits (1 Th Hr = 1Credit & 2 Pr Hr = 1Credit)	153
14	Total Marks	5700
15	Proportion of Hours (Periods), Th : Pr	54:46 (approx.)
16	Proportion of Credits, Th : Pr	70:30 (approx.)
17	Proportion of Marks; Th : Pr	53:47 (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 Course Flow Diagram

Diploma in Automobile Engineering Sample Path

I-ODD	I-EVEN	II-ODD	II-EVEN	III-ODD	III-EVEN
English	Engineering Mechanics	Thermal Engineering	Vehicular System & Body Engg.	Industrial Organization And Management	Automobile Service Management
Applied Chemistry	Communication Skills	Automobile Transmission System	Automobile Manufacturing Process	Design of Automobile Components	Hydraulics & Pneumatics
Engineering Mathematics	Engineering Physics	Materials & Manufacturing Processes	Automobile Engine	Advance Automobile Engine	Transport Management
Computer Applications	Applied Mathematics	Strength of Materials	Electronics System for Automobile	Automobile Electrical & Electronics	Environmental science
Automobile Engineering Graphics	Basics of Electrical System	Theory of Machine	Elective I	Elective II	Elective III
Rural Development	Workshop Practice	Computer Aided Drafting	Automobile Service Practice	Seminar	Vehicle Driving Practice
	Automobile Engineering Drawing	Free Electives	Finishing School	Industrial Training	Project
LEVEL I	LEVEL II	LEVEL III	LEVEL IV	LEVEL V	

Figure 8.1. Course Flow Diagram

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 happened 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, Bender, 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.

(Member Secretary PBOS)

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GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/EE/EC/CM/IT/AE/MT/PK/TX
LEVEL NAME	: GENERAL STUDIES
COURSE CODE	: MN101E
COURSE TITLE	: INDUSTRIAL MANAGEMENT
PREREQUISITE	: 50 Credits
TEACHING SCHEME:	TH: 04; TU: 00; PR: 00
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: NIL
PT.	: 01 HR

❖ RATIONALE:

Managing personnel and scarce resources in any organization is one of the primary & most challenging functions in industries. Scientific Management studies have evolved techniques for the same. The success of an enterprise depends upon how effectively the manpower is organized to work. The students of engineering who will be joining as technicians in the industrial organization are expected to have preliminary information about these said procedures

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Illustrate various forms of organization and its necessity and different aspects of entrepreneurship.
2. Analyze different sources of finance for industry to fulfill capital needs.
3. Interpret principles of human resource management, safety engineering and supervisory management along with various industrial acts
4. Illustrate various functions of marketing management and inventory control.
5. Calculate various cost of production, selling price of a product and its depreciation.
6. Analyze concept of TQM and modern techniques of quality control.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction to Management & Entrepreneurship	1. Define Management, Organization, Administration and Entrepreneurship. 2. Compare Management, Organization, Administration. 3. Interpret appropriate type of ownership. 4. Carry out different methods of selection of organization. 5. Define Function of Management. 6. Describe Entrepreneurial qualities/traits. 7. Acquire industrial work culture 8. Describe successful entrepreneurs 9. Select Government subsidies	1.1 Definitions: Management, Organization, Administration and Entrepreneurship. Forms of ownership: Proprietorship, Partnership, Joint stock co. 1.2 Co-operative sector, Public sector, Government Undertaking, Advantages, limitations & Application of each type, comparison between different forms 1.3 Types of Organization: Line, Functional, line & staff organization, Advantages, limitations & Applications of each type, comparison between different types. 1.4 Functions of Management: - Forecasting, Planning, Organizing Directing, Motivating, Controlling, Coordinating, Decision-making, 1.5 Principles of management, Levels of management - Function of each level. 1.6 Entrepreneurship: Concept, Types of Entrepreneur, Characteristics of Entrepreneur, Women entrepreneurship, problem faced by women entrepreneur. 1.7 Case studies on successful entrepreneurs 1.8 Government subsidies for entrepreneur: Expert lecture on it. (No questions should be asked on the subtopic 1.7 & 1.8)	12
2.Financial Management	1. State the need and sources of finance. 2. Define and differentiate Shares and debentures. 3. Construct Break Even point in an Industry. 4. Analyse Break even point 5. Calculate E.O.Q. 6. Compare types of capital. 7. Acquire basics & financial Management techniques.	2.1 Need of Finance and Sources of finance for enterprises -Short term, Medium term and long term sources. 2.2 Shares, debentures, types of shares and Comparison between shares & debentures 2.3 Break Even Analysis- Importance of Breakeven point, E.O.Q. (numerical on EOQ) 2.4 Types of capital: fixed and working capital	10

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
3. Human Resource Management	1. State Concept, aim,& objectives of HRM. Describe Functions of HRM. 2. Interpret the need of welfare & safety, Industrial Hygiene. 3. Define functions of Supervisors. 4. Identify&/choose proper style of supervision. 5. Describe industrial act	3.1 Concept, aim , & objectives of HRM. 3.2 Functions of HRM: planning, organizing, staffing, recruitment, education & training- need, methods of training, , Motivation, controlling, compensation, integration and maintenance. Labour welfare , Industrial relations 3.3 Safety engineering: need, organization, committee, programme, instructions & training. Accidents: causes & prevention. 3.4 Characteristics of supervisors, functions of supervisors and styles of supervision& its advantages and limitations. 3.5 Industrial act: Need, Factory act 1948, ESI act, Workmen compensation act only	10
4. Marketing and inventory management	1. Describe the activities of Marketing Management. 2. State inventory management technique. 3. Use marketing strategies. 4. Select sales promotion and media	4.1 Definition of Market, Functions of Marketing Department 4.2 Marketing strategies, Marketing environment, Consumer behavior, Market research, Market survey, marketing mix. 4.3 Sales forecasting, Sales promotion, advertising, media selection. 4.4 Definition of inventory & inventory control. 4.5 Types of inventory items in industries, ABC and VED analysis only	12
5. Estimation and Costing	1. Define & calculate various cost and expenses involving in Product manufacturing. 2. Calculate the selling price of product. 3. Describe balance sheet. 4. Define& compare depreciation and obsolescence. 5. Describe& Calculating depreciation.	5.1 Product cost determination, Direct Cost and Indirect Cost, Material Cost And Labour Cost, Expenses- Factory and Overheads. 5.2 Determination of Selling Price of product- Profit and Loss Statement, Balance sheet description. 5.3 Depreciation &, Obsolescence- Concept and Comparison. 5.4 Methods of Calculating depreciation- straight line, reducing balance, annuity, sinking fund & sum of the digit methods. (Simple Numericals on subtopic 5.1, 5.2 & 5.4)	10

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
6. Total Quality Management	1. Define terms related to TQM 2. Describe various quality control techniques. 3. Interpret importance of quality circle and ISO 9000 4. Compare ISO9000 and TQM	6.1 Concept and definition of Quality, Quality Control, Quality Conformance and Quality Assurance. 6.2 TQM- Concept and Objectives, Process 6.3 Quality control techniques: Lean Manufacturing -JIT,5”S”, Six sigma, Kaizen, BPR 6.4 Quality Circle and ISO 9000, ISO 14000, ISO 9001: 2015, ISO 14001: 2015, Difference between ISO9000 and TQM,	10
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.	Management	04(04)	10(04)	00(00)	14(08)
02.	Financial Management	04(00)	04(06)	04(00)	12(06)
03.	Human Resource Management	02(00)	04(06)	06(00)	12(06)
04.	Marketing And Inventory Management	04(04)	06(00)	00(04)	10(08)
05.	Estimation And Costing	06(04)	04(02)	02(00)	12(06)
06.	Total Quality Management	04(04)	06(00)	00(02)	10(06)
	Total	24(16)	34(18)	12 (06)	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	2	R	2	3	R	2	1	A	2	5/7
	1	R	2																
02	1	U	4	2	A	4	2	U	4	1	A	4	4	A	4				3/5
03	4	R	4	3	U	4	5	R	4	4	U	4	5	U	4				3/5
04	5	A	4	5	U	4	6	R	4	6	U	4	6	A	4				3/5
05	3	A	6	4	U	6	2	U	6										2/3
06	1	U	6	6	U	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, 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:****For Mechanical Engineering Program:**

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	2	3	–	–	3	3	–
4	3	–	–	–	3	–	3	–	–	3	3	–
5	3	–	–	–	3	–	3	–	–	3	3	2
6	3	–	–	–	3	2	3	–	–	3	3	2

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

For Other than Mechanical Engineering Program:

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	3	–	–	–	3	2	3	–	–	3	–	–
4	3	–	–	–	3	–	3	–	–	3	–	–
5	3	–	–	–	3	–	3	–	–	3	–	–
6	3	–	–	–	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.	Industrial Engineering & Management	T.R.Banga & S.C.Sharma, Khanna Publishers, Edition-25, 20142	10: 81-7409-078-9 13:978-81-7409-078-9
2.	Industrial Engineering And Management	O.P. Khanna, Dhanpat Rai, New Delhi, 1980	81-885-9777-5
3.	Industrial organization and management	Lawrence L Bethel & James L Riggs, New York, McGraw-Hill [1971], 6 th , 1979	09-322-3849-1
4.	Industrial Management	I.K.Chopde & A.M.Sheikh, S.Chand & Co. Ltd, Delhi, 2 nd , 1999	81-219-1480-9
5.	Industrial engineering: Organization and management	Tara Chand, Publisher: Nem Chand, 5 th , 1982	B0007BSSB0
6.	Engineering Economics	Tara Chand, Publisher: Nem Chand, 14 th , 2014	81-85240-82-5
7.	Entrepreneurial Development	S.S.Khanka, S.Chand & Co. Ltd, Delhi, 1 st , 1999, reprint 2006	81-219-1801-4

❖ **E-REFERENCES:**

- <http://www.free-management-ebooks.com/index.htm> , assessed on 22th March 2016 .
- <https://www.youtube.com/watch?v=oQ1OTaJ9Sfc&list=PLB628C837430CB736&index=3> assessed on 23th March 2016
- <https://www.youtube.com/watch?v=2PkrT1ko3Yk&list=PLB628C837430CB736&index=10> assessed on 24th March 2016
- <http://www.slideworld.com/pptslides.aspx/industrial-management> assessed on 24th March 2016
- http://www.powershow.com/view/e4cd2mMwY/Industrial_Organization_I_powerpoint_ppt_presentation assessed on 25th March 2016

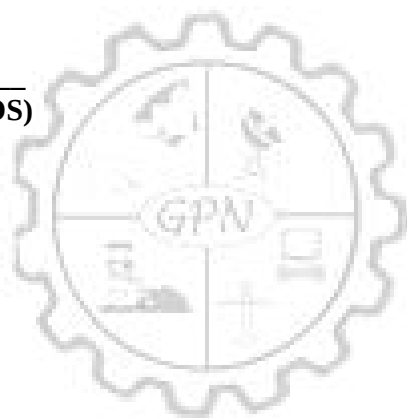
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

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

S.N.	Name	Designation	Institute / Industry
1.	Mr. V.S Ikhar	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
2.	Mrs. R A Gadekar	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
3.	Mr. 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/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

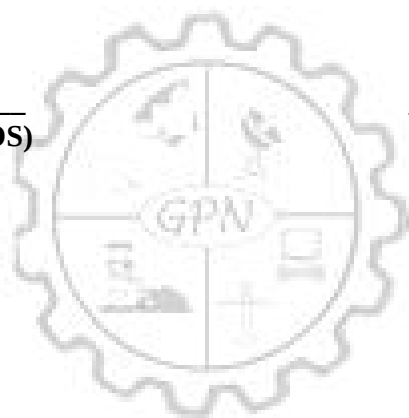
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

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\(y4dqrc55g1m1qhnd4soqih45\)\)/pdf/.../January.pdf](http://yojana.gov.in/CMS/(S(y4dqrc55g1m1qhnd4soqih45))/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

30/03/2016 <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 ME/AE/MT/PK
LEVEL NAME	: BASIC SCIENCE COURSES
COURSE CODE	: CH 201E
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., 2 PR CREDIT = 1 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 Applied chemistry is essential to mechanical engineering course group. It provides knowledge about the appropriate use of engineering materials, their protection, study of extraction of iron, study of different fuels and their usage and lubrication process in different working conditions of machines. 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 fuel and lubricants 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). Valence: 1.5 Definition & types of valence (Electrovalence & Covalence). 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. State different processes of Heat treatment. 3. Select effects of alloying elements on properties of steels. 4. State importance and purposes of heat treatment of steel.	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, Thermocole and Glass wool. 4. Describe applications of Polyethylene & Bakelite plastic	Condensation process (by giving e.g. of Polyethylene & Bakelite plastic Respectively) 3.3Rubber: Types of Rubber. 3.4Natural 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. 3.7 Insulating material Definition & Characteristics of Thermal insulators. Preparation, Properties & Applications of Thermocole & glass wool.	
4. Energy	1. State characteristics of a good fuel. 2. State significance of proximate analysis of a fuel. 3. Describe the process fraction distillation of crude petroleum. 4. State significance of Biogas, LPG and CNG. 5. Compare different types of fuel- solid, liquid and gaseous.	Energy 4.1 Definitions of a fuel, calorific value and ignition temperature, 4.2 Characteristics of a good fuel, Classification of fuels with suitable examples, advantages and disadvantages of solid fuels, liquids fuels and gaseous fuels. Classifications of fuel : 4.3 Solid fuels: analysis of solid fuels- Proximate analysis for determination of moisture, volatile matter, ash and fixed carbon, significance of Proximate analysis, 4.4 determination of gross calorific value by using Bomb calorimeter. 4.5 Liquid fuels—Origin, fractional distillation of crude petroleum, boiling range, composition and applications of petroleum fractions obtained. 4.6 Composition, properties applications of- Biodiesel. Gaseous fuels 4.7Composition,properties,applications of Biogas, LPG, CNG	16
5. Lubricants	1. State functions of lubricants 2. Describe the mechanism of lubrication. 3. State characteristics of Lubricants. 4. Select proper lubricant on the basis of different types of machines.	5.1 Definition, Types of Lubricants, Functions of Lubricants. 5.2 Types of lubrication. Fluid film lubrication, Boundary lubrication and Extreme pressure lubrication. 5.3 Characteristics of Lubricants- Viscosity, oiliness ,viscosity Index, oiliness , Volatility, cloud and pour point, Flash and fire point, Neutralization number, emulsification. 5.4 Selection of Lubricant for various types of machines such as I.C engine, steam engine	10

		cylinder Gear system, cutting tools delicate and simple machines, tractors and rollers.	
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. OR Determine the percentage of copper in given alloy sample.	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.		02
6	Determine the percentage of moisture content in the given coal sample.	Energy	02
7	Determine the percentage of ash content in the given coal sample by proximate analysis.		02
8	Determine coefficient of viscosity using Ostwald's Viscometer	Lubricants	02
9	Determine acid value of lubricant by KOH OR Determine flash point of lubricant by use of flash point apparatus.		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 Alloy	02(00)	04(06)	06(00)	12(06)
3	Non-Metallic Engineering Material	06(00)	04(04)	00(00)	10(04)
4	Energy	02(04)	10(02)	06(04)	18(10)
5	Lubricant	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. Muffle furnace(temp. measure up to 1500⁰ c)
9. Oven (temp measure up to 500⁰ c)

❖ **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 AUTOMOBILE ENGINEERING
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: AE301E
COURSE TITLE	: AUTOMOBILE ENGINEERING GRAPHICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; 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	: 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 automobile engineering field. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in production sector. 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 courses like automobile engineering drawing, and computer aided drafting and design.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Draw geometrical figures, curves, sketches etc.
2. Construct the views of an object by using principles of orthographic projection.
3. Visualize three dimensional objects and draw isometric projections.
4. Apply various drawing codes, conventions and symbols as per IS SP-46
5. Analyze different surfaces & free hand sketches
6. Read the drawings.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Principles of drawing	1. Use of instruments for drawing, scales, lines and their applications. 2. Use of IS SP-46. 3. Redraw the given drawing.	1.1 Use of different drawing instruments and equipment 1.2 Types of letters and numbers (single stroke vertical 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	06
2. Engineering curves.	1. Draw conic sections. 2. Draw involute, cycloid and state their applications.	2.1 To draw an ellipse by i)Arcs of circles method ii) Rectangle method iii)Concentric circles method 2.2 To draw parabola I) Rectangle method 2.3 To draw hyperbola by I) Passing through a given point with reference to given asymptotes 2.4 To draw involutes of circle and polygon of maximum six sides 2.5 To draw cycloid, epi-cycloid and hypo-cycloid	10
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	12
4. Isometric projections	1. Visualize, interpret and draw Isometric views from given orthographic views	4.1 Isometric scales 4.2 Isometric views of simple object (plane surfaces, slanting surfaces, and Rectangular, V, Trapezoidal slots)	12
5. Development of surface	1. Visualize, interpret and draw development of lateral surfaces like cube, prism, cylinder, pyramid, cone	5.1 Introduction to development of surface 5.2 Method of development 5.3 Development of lateral surfaces(cube, prism, cylinder, pyramid, cone) 5.4 Development of transition pieces	14

6. Free hand sketches	1. Prepare proportionate freehand sketches of given Automobile components 2. Describe functions and use of Automobile components	6.1 Nut - Metric Flang lock nut, Metric free spinning Hex Flang nut, 6.2 Bolts – square and hexagonal bolts, Battery hold down bolts, Radiator bolts 6.3 Rubber caps, oil Drain plug Gasket, plug Button ,Gasket 6.4 Valve-Inlet, Exhaust 6. 5. Piston ,Connecting rod, Piston pin	10
		Total Hrs.	64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw types of lines, lettering, numbers are to be drawn on two problem on scale, and two problems on redraw (01 Sheet)	1. Principles of drawing	06
2	Draw four Engineering Curves 1. Ellipse/Parabola/Hyperbola (draw any two problems using any one method) 2. Involute/ cycloid/(Epicycloid/Hypocycloid) (Draw any two problems) (01 Sheet)	2. Engineering Curves	10
3	Draw two problem using first angle method of projection (01 Sheet)	3 Orthographic Projections	12
4	Draw one problem with plane surfaces & other with slot, slanting surfaces (using natural scale and isometric scale) (01 Sheet)	4. Isometric Projections	12
5	Draw two problems on development of surfaces (one problem on parallel line development and one problem on cone or pyramid development) (01 Sheet)	5. Development of surfaces	14
6	Draw Free Hand Sketches – Draw any Eight free hands sketch on automobile parts (01 Sheet)	6. Free Hand Sketches	10
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	Development of Surfaces	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:**

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	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	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=fvj7PlxAuo>, 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) Mini-drafter

❖ **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.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr. S.A. Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr. J.M.Sayed	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6.	Mr.S.S.,Vaidya	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7.	MrK.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8.	MrP.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9.	MrM.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10.	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11.	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

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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 AUTOMOBILE ENGINEERING
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: EE305E
COURSE TITLE	: BASICS OF ELECTRICAL SYSTEMS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 2CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

Automobile engineering students should know the facts, concepts, principles and procedures in electrical engineering. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to electrical area. It is very useful course for understanding the basic level knowledge in the field of electrical engineering.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Follow electrical safety concept.
2. Apply principles and basic laws in electrical engineering for different applications
3. Solve simple electrical circuits.
4. Connect electrical measuring instruments in the circuit
5. Operate electrical equipment
6. Test electric motors

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Electrical Safety	1. Recall electrical safety rules. 2. Remove the electrocuted person from live conductor 3. Interpret electrical safety signs and symbols 4. Carry out different methods of artificial respiration on electrocuted person 5. Use fire-fighting equipment on different types of fires. 6. Classify various types of earthing. 7. State the need of earthing.	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, Silvestre'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. 1.5 Earthing- Necessity of earthing, methods of reducing earth resistance.	6
2. Fundamentals of electricity	1. Define the various electrical parameters 2. Select the different types of materials for particular applications. 3. State various laws and its applications. 4. Calculate the temperature coefficient of resistance 5. Describe concept of DC voltage & current. 6. Solve series & parallel resistive circuit.	2.1 Concept of electric charge, current, voltage drop, EMF, potential difference, Direction of current and their SI units. 2.2 Types of material-conductor, insulator and semiconductor, properties and application. 2.3 Resistance, unit of resistance, Law of resistance (Factors affecting resistance), Effect of temperature on resistance, Ohms law (simple numerical on 2.3). 2.4 Resistance in series, properties of series circuit, voltage distribution in series circuit, equivalent resistance of series circuit, Applications of series circuits, 2.5 Resistance in parallel, properties of parallel circuit, current distribution in parallel circuit, equivalent resistance of parallel circuit,	10

		Applications of parallel circuits, (Numerical problems based on 2.4,2.5) 2.6 Kirchhoff's current and voltage law(no numerical) 2.7 Work, power, energy and their SI units, Relation between H.P and watts, Kwh and Kcal. 2.8 Concept of generation of single phase AC power. Definition of cycle, time period, frequency, amplitude, RMS value, average value. 2.9 Connection of ammeter, voltmeter and wattmeter in single phase AC circuit. and its measurement. 2.10 Comparison between AC and DC	
3.Magnetism & Electromagnetism	1. Define terms related to magnetism. 2. Describe molecular theory of magnetism. 3. State Faradays law of electromagnetism. 4. Apply faradays law of electromagnetic induction.	3.1 Concept of magnetism 3.2 Important terminologies (definitions)- magnetic lines of force, magnetic flux, magnetic flux density (B), magnetic field strength (H), magneto motive force (mmf), reluctance, permeability. 3.3 Electromagnetism- Introduction, Faradays law of electromagnetic induction, direction of induced emf and current-Fleming right hand rule, Fleming left hand rule and Lenz law. 3.4 Nature of induced emf- I. Dynamically induced emf. II. Statically induced emf-its classification- i. self induced emf ii. mutual induced emf.	8
4. Transformer	1. State Law of electromagnetic induction 2. Solve problems related to transformer. 3. Describe the concept of transformation ratio, KVA rating of transformer, 4. Classify the different types of transformer.	4.1 Single phase Transformer – Introduction, Principle of operation, working of transformer. 4.2 types of transformer, shell type and core type, their construction, comparison, and applications 4.3 EMF equation (No	10

	5. Compare shell type and core type transformer	derivation), transformation ratio, KVA rating of transformer, (Simple Numerical problem based on emf equation and transformation ratio only).	
5. Drives	1. Classify different types of DC motors. 2. Describe construction and working of DC motor. 3. Control the speed of DC series motor. 4. Demonstrate dynamo.	5.1 Broad classification motors(AC/DC). 5.2 DC Motor- Working principle, construction, classification of DC motors 5.3 DC series motor -Schematic diagram, working & applications, reversal of rotation, speed control methods-1.armature control method, 2.Flux control method. 5.4 Brushless DC Motor- Introduction, principle, construction, working and speed control. 5.5 Dynamo - Classification of dynamo used in automobiles DC generator-Introduction, principle, construction, working and application. Alternators-Introduction, principle, construction, working and application.	8
6. Wiring	1. Identify different types of wiring accessories. 2. Select different accessories for particular type of installation. 3. Classify different types of wires. 4. Predict the faults in installation. 5. Use of Megger for measurement of insulation resistance of electrical installation.	6.1 Wiring accessories- test lamp, switches, Fuses, ICDB, ICTP, MCB, ELCB, their selection, rating and application. 6.2 Wires – types, Specification and selection for particular use. 6.3 Wiring diagram of head light, horn, turn indicator, stop light. 6.4 Use of megger as insulation resistance tester.	6
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Use firefighting equipment on fire and execute safety precautions in laboratory	Electrical safety	2
2	Connect voltmeter, ammeter and wattmeter in electrical circuit for measurement of electrical quantity.	Fundamentals of Electricity	2
3	Find unknown resistance using ohms law and observe the effect of temperature on resistance of conductor.		2
4	Measure the total resistance of series circuit & parallel circuit		2
5	Find the branch current and mesh voltage using Kirchhoff's laws. (KCL & KVL)		2
6	Measure different parameters by using tong tester and multimeter.		2
7	Determine the voltage and current ratio of single phase transformer.	Transformer	2
8	Identify different parts of Dynamo.	Drives	2
9	Start D.C. series motor and reverse the direction of rotation		2
10	Control the speed of D.C. series motor by using field control method and armature voltage control method.		4
11	Use test lamps for testing single-phase and three – phase supply. Use of test lamp for earth continuity. Use of tester on single-phase supply.	Wiring	2
12	Perform different test on electric motor such as continuity test, earth fault test, insulation resistance test using Megger		2
13	Identify different electrical accessories like switches, socket outlets, ELCB, MCB, ICTP, ICDP, fuses etc.		2
14	Prepare wiring board to control head light & horn of two wheeler.		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	Electrical Safety	02(00)	08(00)	00(06)	10(06)
02	Fundamentals of electricity	02(02)	08(00)	06(06)	16(08)
03	Magnetism & Electromagnetism	02(00)	04(04)	00(00)	06(04)
04	Transformer	02(04)	08(04)	06(00)	16(08)
05	Drives	02(00)	04(08)	06(00)	12(08)
06	Wiring	04(02)	00(04)	06(00)	10(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	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	4	R	4	3	U	4				3/5
03	2	U	4	3	U	4	4	U	4	4	U	4	5	U	4				3/5
04	6	R	4	4	U	4	5	U	4	5	U	4	6	U	4				3/5
05	2	A	6	4	A	6	1	A	6										2/3
06	5	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	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

❖ **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	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-
4	3	-	2	2	-	-	-	2	2	2	-	-
5	3	-	2	2	-	-	-	2	2	2	-	-
6	3	-	2	2	-	-	-	2	2	2	-	-

❖ **REFERENCE & TEXT BOOKS:**

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. Tarrekar and P. K. Kharbanda, S. Chand & Company Ltd., Third, 1990	13: 978-8121901048

❖ **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

- www.learnerstv.com/Free-engineering-Video-lectures-ltv059-Page1.htm assessed on 28th Feb 2016
- www.studyaaar.com/index.../11-basic-electrical-a-electronics-engineerin assessed on 28th Feb 2016
- www.faadooengineers.com/.../448-BASIC-ELECTRICAL-ENGINEERIN assessed on 28th Feb 2016.
- <https://www.scribd.com/.../Lecture-Notes-Basic-Electrical-and-Electronic> assessed on 28th Feb 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

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. Megger 500V/1000V Hand driven.
8. Tong tester.

❖ 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.	Mrs K. M. Gaidhane	I/C, Head of Electrical Engineering	Government Polytechnic, Nagpur.
3.	Mr. R. I. Kamble	Lecturer in Electrical 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. H, N.Kharkar	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
8	Mr. N. H. Adkine	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
9	Mrs. A.P. Gandhi	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
9	Mr. Bhashkar Bale	Dy. Executive Engineer,	MSTCL, Nagpur

10	Mr. R.Y.Ghormade	Head of Electrical Engineering	Dharampeth Polytechnic, Nagpur
11	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 AUTOMOBILE ENGG.
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: EC306E
COURSE TITLE	: ELECTRONICS SYSTEM FOR AUTOMOBILE
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH.TEE	: 03 HRs
PR.TEE	: 02 HRs (Internal)
PT.	: 01HRs

❖ **RATIONALE:**

Automobile engineering students should know the facts, concepts, principles and procedures in Electronics engineering. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to electronics area while dealing with automobile sector. It is very useful course for understanding the Basic and applied level knowledge in the field of Electronics engineering in automotive sector.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

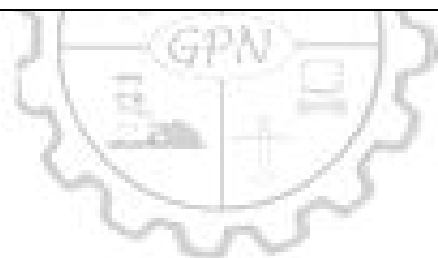
1. Identify electronics components, devices and transducers
2. Identify different measurement parameters.
3. Identify different programmable devices.
4. Measure various parameters using various transducers and measuring instruments.
5. Test active and passive components.
6. Analyse different logic gates, its truth tables and different programmable control devices.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction to Electronics and components	1. State the concept of Electronics Engineering 2. List application of Electronics in automobile sector 3. Draw symbol and identify passive components	1.1 Electronics Engineering evolution 1.2 Automobile Engineering and Electronics –Necessity and application 1.3Passive components-Resistors, capacitors & inductors –their properties, Common types, and Uses	4
2.Semiconductor devices	1. Define various terms related to semiconductor and devices. 2. Draw symbol for various semiconductor devices. 3. Plot and analyse the characteristics for diode 4. State the Principle of operation of zener diode 5. List types of rectifier 6. Compare rectifiers 7. Draw and describe the operation of half and full wave rectifier 8. List basic types of transistors 9. Significance of amplifier 10. Identify photo devices 11. State the concept of oscillators	2.1Semiconductors–Types, Energy bands, Doping, 2.2 Diode-PN junction, Zener diode - Construction symbol, Characteristics and applications. 2.3 Rectifier type-half wave, full wave (Center-tapped), Circuit diagram, working, waveforms. Filters-Necessity, Types (C, LC, Π type) (no working). 2.3Transistor-BJT: NPN, PNP transistor-Construction, symbol, working of NPN transistor only, Applications. 2.5Transistorised Amplifier- Common emitter configuration only 2.6 Photo devices - Photodiode, LED, LDR, photo transistor working, Symbols, Application 2.7Concept of Oscillators	10
3.Transducers Sensors and applications	1. Define various terms related to transducers sensors. 2. State significance of transducers 3. Classify transducers 4. Describe types of transducers 5. List application of	3.1 Transducers- General aspects of Instrumentation, Classification of transducers, Basic requirements of transducers 3.2 Passive transducers-strain gauge, thermistor, Hall-Effect transducer, LVDT 3.3Active transducers–	10

	transducers in instrumentation 6. Identify Transducers Sensors	Piezoelectric and Thermocouple. 3.4 Electromechanical type transducers:-resistance type, Inductive (LVDT), Capacitive, Piezoelectric. 3.5 Photoelectric type transducers: Photo emissive ,Photovoltaic, Photoconductive	
4.General Measurements	1. State concept of measurement 2. Classify measurement 3. Describe different methods of measurement	4.1 Concept of General measurement system 4.2 Measurement of Pressure:- Vacuum gauge: Pirani vacuum gauge, Varying pressure measurement; 4.3 Measurement of Flow - Hot wire anemometer, Ultrasonic flow meter; 4.4 Measurement of Temperature - Working of thermocouple, Working of Thermopiles, Thermistor 4.5 Measurement of Speed:- contactless electrical tachometer, Inductive, Capacitive type tachometer, Stroboscope 4.6 Measurement of Force:- Strain gauge load cell	10
5.Digital Electronics	1. Define number system 2. Draw and relate symbol and truth table for different logic gates and explain 3. Draw Block/logic diagram for flip flop, multiplexer, demultiplexer, encoder, decoder and describe its operation 4. Define counters and registers 5. Draw and describe working operation for registers and counters 6. Draw and describe working for LED and LCD display	5.1 Number systems–binary codes 5.2 Define analog signal and digital signal 5.3 Logic gates-NOT,OR, NOR, AND, NAND, their symbols and truth table 5.4 Flip Flop - RS (using NAND gate) & D Flip flop (only), symbols and truth table 5.5 Working principle with block diagram of Multiplexer and demultiplexer (1:4) 5.6 Working principle with block diagram of encoder & decoder 5.7 Working principle with block diagram of shift register &	08

		counter 5.8 Working of seven segment LED display, Introduction to LCD Display	
6.Introduction to programmable devices	1. Define microprocessor 2. List application of microcontroller in automobile Engg 3. Compare between microprocessors and microcontrollers 4. Draw and describe block diagram for 8051 microcontrollers 5. Draw and describe block diagram for PLC	6.1 Introduction to Microprocessors 6.2 Microcontroller- Types, 8051 microcontrollers -Features, Pin diagram, Block diagram, Application, Compare Microprocessors and microcontrollers 6.3 Embedded System fundamentals and concept 6.4 Concept and necessity of CAN Bus, I2C Bus in automobile sector. 6.5 Programmable Logic Controllers- Types, Features, Block diagram, Application	06
Total Hrs.			48



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	i) Set the proper voltage & current limits with controls in regulated power supply. ii) Measure voltage & currents using multimeter	Measurement of Parameters	2
2	Use the different front panel controls of CRO for measurement.		2
3	Measure Vpp & Frequency for different waveforms generated from function generator on CRO.		2
4	Identify and Test of Passive components like resistors, capacitors and inductors	Introduction to Electronics and components	2
5	Test of active component like Diode,Zener,Transistors,LED	Semiconductor devices	2
6	Plot the V-I characteristic of diode		2
7	Plot the output for full wave rectifier		2
8	Analyze transistor as a amplifier		2
9	Measure the linear displacement using LVDT	Transducers Sensors and applications	2
10	Relate the truth table for different logic gates and compare -AND,OR,NOT,XOR,NOR,NAND	Digital Electronics	2
11	Relate and analyze the truth table for multiplexer/demultiplexer		2
12	Relate and analyze the truth table for SR,D flip-flop		2
13	Interpret details of educational kit for Microcontroller and execute sample program on it.	Introduction to programmable devices	4
14	Interpret details of educational kit for PLC and execute sample program on it.		4
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Electronics and components	00(02)	04(00)	00(00)	04(02)
02	Semiconductor devices	06(02)	08(08)	06(00)	20(10)
03	Transducers Sensors and applications	02(00)	04(00)	06(06)	12(06)
04	General Measurements	02(00)	06(04)	00(00)	08(04)
05	Digital Electronics	06(04)	04(08)	06(00)	16(12)
06	Introduction to programmable devices	02(00)	08(00)	00(06)	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	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

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, 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)										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	3	-	-
2	3	-	-	-	-	-	-	-	-	3	-	-
3	3	-	-	-	-	-	-	-	-	3	-	-
4	3	-	2	2	-	-	2	2	-	3	-	-
5	3	-	2	2	-	-	2	2	-	3	-	-
6	3	-	2	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.	Principles of Electronics	V. K. Mehta, S. Chand	8121924502, 9788121924504
2.	Introduction to process instrumentation	C. D. Johnson, Prentice Hall Inc.	10: 0471853402
3.	Programmable logic control	F. D. PETRUZELLA, 4th Ed. Tata-McGraw Hill.	978-0-07-351088-0.
4.	Modern Digital Electronics	R P Jain. Tata McGraw-Hill Education,	0070494924, 9780070494923.
5.	Microprocessors, Architecture , Programming, and applications with the 8085	Ramesh S. Gaonkar Penram International	81-900828-7-6

6.	8051Microcontroller and embedded system using assembly and C	Muhammad Ali Mazidi, Pearson	10: 8131710262 13: 978-8131710265
7.	Electrical and electronic measurement and instrumentation	A. K. Sawhney, Dhanpatrai and Sons	10: 8177001000 13: 978-8177001006

❖ E REFERENCES

- <http://www.electrical4u.com/> assessed on 4.05.2016
- <http://www.explainthatstuff.com/> assessed on 4.05.2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- Power Supply 0-12V
- Function Generator
- Digital Multi-meter
- Cathode Ray Oscilloscope
- Digital Storage Oscilloscope

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

S.N.	Name	Designation	Institute / Industry
01	Mr. S. S. Tadas	HOD, Electronics &Telecomm Engineering	Government Polytechnic, Nagpur.
02	Mr. D. B. Alaspure	Lecturer in Electronics Engineering	Government Polytechnic, Nagpur.
03	Mrs. M. N. Bawne	Lecturer in Electronics & telecomm Engineering	Government Polytechnic, Nagpur.
04	Mr. D. A. Bramhankar	Lecturer in Electronics & telecomm Engineering	Government Polytechnic, Nagpur.
05	Mrs. H. R. Bhusari	Lecturer in Electronics & telecomm Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: AE302E
COURSE TITLE	: MATERIALS AND MANUFACTURING PROCESS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (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:**

Variety of materials is being tried in producing motor vehicle in general & it's various systems in particular. It is being done in order to satisfy counter acting expectations of customers, society & at large our mother earth. By producing several parts and then assembling them together results into a motor vehicle for which every motor vehicle industry contains various shops like machine shop, press shop, chassis shop, paint shop on one side & assembly shops on the other. As an Automobile Engineering Technician, a position in industry that supervises production of Automobile components & motor vehicle on one hand & servicing and repairs of sold vehicles on the other should be able to observe, describe & interpret various materials used in modern motor vehicles. As she/he is required to analyses function of assembly and failure of parts, She/he should know basic & advance manufacturing process used.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Analyze automobile material properties for different applications
2. Select automobile materials for motor vehicle and its components.
3. Identify various heat treatment processes.
4. Prepare a report on auto materials and manufacturing process
5. Perform the different welding operations.
6. Develop the patterns and moulds for castings.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1 Auto Materials	1. State requirements of ideal Auto materials. 2. Classify materials used in automobiles. 3. Describe applications of ferrous auto materials 4. List the properties of ferrous auto materials	1.1 Requirement of ideal Auto materials 1.2 Classification of materials used in Automobiles. 1.3 Properties of Auto materials. 1.4 Ferrous materials and its alloys: Cast Iron and Steels – Types, their properties & applications	08
2 Nonferrous materials	1. Identify the types of Nonferrous auto materials. 2. State the advantages of Nonferrous auto materials.. 3. Suggest Auto materials for the frame. 4. Justify, the use of Nonferrous materials for automobiles.	2.1 Nonferrous materials and its alloys: Copper, Brass, Bronze, babits, Aluminum and Magnesium, their properties & applications. 2.2 Ceramics -Properties of ceramic material and applications. 2.3 Polymers materials: Properties and applications of thermoplastic, thermo-setting plastics, rubber. 2.4 Glass fiber and carbon fibre: Properties and applications.	14
3 Heat Treatment	1. Enlist and describe various heat treatment processes. 2. State the applications of common heat treatment processes. 3. List the surface hardening processes.	3.1 Introduction: Concept of phase and phase transformation. 3.2 Iron-Iron carbide phase (Fe-Fe ₃ C) equilibrium diagram. 3.3 Common heat treatment processes and their applications; Annealing, Normalizing, Hardening, Tempering. 3.4 Surface hardening processes: Gas carburizing, Nitriding, Cyaniding, 3.5 Induction and Flame hardening.	10
4 Moulding and Casting	1. Define Casting. 2. Describe Green sand molding 3. Classify the molding process. 4. Analyze the casting defects.	4.1 Introduction - 4.2 Pattern making: Types and materials 4.3 Moulding : Classification of molding, Green sand molding and Cores, 4.4 Casting: Permanent mould casting, centrifugal casting process and Die-casting process, 4.5 Casting defects, causes and remedies.	10

5 Forging Process	1. Define forgeability . 2. State applications of forging. 3. List the forgeable materials. 4. Describe the defects in forged parts.	5.1 Forging and Forgeability 5.2 Advantages, dis-advantages and its applications 5.3 Forging tools and forging method: Hand tools, forging operations, 5.4 Power Forging: Spring hammer, Drop hammers 5.5 Defects in forged parts and their causes	10
6 Welding Process	1. Define welding. 2. State the applications of Gas welding. 3. Describe Metal inert gas arc welding (MIG) 4. Classify the resistance welding. 5. Sketch and explain Welding Flames. 6. List the Arc welding equipments. 7. Justify Plasma welding is better option than other welding process.	6.1 Concept of weld and weldability 6.2 Arc welding: Arc welding equipments, Electrodes 6.3 Gas welding: Types of flames, Gas welding equipments, 6.4 Resistance welding :Types and applications 6.5 Allied Processes: Soldering. Brazing 6.6 Special welding process: Plasma arc welding, Metal inert gas arc welding (MIG), TIG welding	12
			64

LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a report on the selection of materials and required properties for the automobile. • Search literature on net	Auto Materials	04
2	prepare a wooden pattern for a given job in a group of 4 to 6 student	Moulding and Casting	12
3	Prepare a sand mould for the given pattern (Group of 4 to 6 student).		04
4	Perform arc welding or gas welding as per given drawing and write its procedure.	Welding Process	08
5	Perform five different operations of forging and heat treatments for automobile applications	Forging Process	04
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Auto Materials	02(00)	06(04)	00(00)	08(04)
02	Nonferrous materials	04(02)	08(04)	06(06)	18(12)
03	Heat Treatment	02(00)	04(04)	00(00)	06(04)
04	Moulding and Casting	00(02)	04(04)	08(00)	12(06)
05	Forging Process	04(04)	04(04)	06(00)	14(08)
06	Welding Process	04(00)	08(00)	00(06)	12(06)
	Total	16(08)	34(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	4	A	2	6	U	2	1	U	2	3	R	2	2	R	2	5/7
	4	R	2																
02	2	R	4	1	U	4	3	U	4	4	U	4	5	U	4				3/5
03	5	R	4	2	U	4	4	R	4	1	U	4	3	U	4				3/5
04	2	U	4	4	U	4	5	U	4	2	U	4	5	R	4				3/5
05	6	U	6	4	A	6	2	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

❖ 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 equipment's.	10
2	Procedure and Performance	20
3	Conclusion and Result.	10
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	-	-	-	-	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
6	-	3	3	3	3	-	-	-	-	-	-	3

Slight (Low) 2-Moderate (Medium) 3 –Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Materials Science and Processes	S Hajra Choudhury, Ak Hajra Choudhury, Indian Book Distributing Co, 1 st Edition 1977	9780906216002
2.	Elements of Workshop Technology Vol. –I & II	S. K. Hajra Choudhury A.K. Hajra Choudhury, Media Promoters, 1st South Asian Edition, 2009	8185099146, 9788185099149
3.	Workshop Technology Part – I, II	Dr. W.A.J. Chapman. Edward Arnold, 1 st Edition, 1972	0713132728, 9780713132724
4.	Manufacturing Processes	B. H. Amstead, Phillip F. Ostwald, , Myron L. Begeman, John Wiley & Sons, 8 th Edition. January 1987	0471842362, 978-0471842361
5.	Production Technology	H.M.T., Tata McGraw-Hill Education, 1 st Edition, 2001	0070964432, 9780070964433

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=wkyPCxc2Mzg> , assessed on 6th April 2016
- <https://www.youtube.com/watch?v=r5xmVPr8Aa8> , assessed on 6th April 2016
- https://www.youtube.com/watch?v=jx4tRAU_Tp8, assessed on 6th April 2016

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr.Abhas Disawal	Enterpreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/AE
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: ME303E
COURSE TITLE	: THERMAL ENGINEERING
PREREQUISITE	: NIL
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	: 03 HRs
PR. TEE	: NIL
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Thermal Engineering is a core subject in mechanical engineering. This course includes the study of basic laws & concept of thermodynamics, gas laws, properties of steam and steam generation. Mechanical engineer should understand working and application of various processes of thermal power plants.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply fundamental concepts and laws of thermodynamics to thermodynamic systems.
2. Illustrate the concept of steam generation, steam properties and vapour processes.
3. Analyze the construction and working of boiler and its mountings.
4. Interpret the construction and working of condenser and cooling towers.
5. Interpret the construction and working of steam turbine and Nozzle
6. Illustrate the different modes of heat transfer.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Basic Concepts	1. Define fundamental concept of thermodynamics. 2. Apply first law of thermodynamics to various thermodynamic devices. 3. Apply second law of thermodynamics. 4. State ideal gas laws. 5. Represent various ideal gas processes on P-V and T-S diagram.	1.1 Thermodynamic system, boundary, surrounding, Thermodynamic properties, state, process, path of the system, Reversible and irreversible processes, Energy, Work and heat. Reversible work. Zeroth Law of Thermodynamic. (Simple Numerical). 1.2 First Law of Thermodynamic Concept of perpetual Motion machine 1, Application of first law of Thermodynamic to Non flow or closed system. And steady flow process, Enthalpy, Ideal gas laws, gas equation. Characteristic & universal gas constants, representation of various gas processes on P-V and T-S diagram. Specific heat at constant pressure & constant volume, ratio of specific heats. (Simple Numerical). 1.3 Limitation of first law of thermodynamics, Second Law Of Thermodynamics, Kelvin Plank & Clausius statement, clausius Inequality, Application of Second law to Heat Engine, Heat Pump and refrigerator, COP of Refrigerator, PMM-II, and Entropy, Entropy change in reversible and irreversible processes. (Simple Numerical)	18
2. Steam Generator	1. State the concept of steam generation. 2. Calculate the properties of steam 3. Use of steam tables and mollier chart. 4. Describe construction and working of different types of boilers and functions of boiler mountings and accessories 5. Describe boiler draught	2.1 Generation of steam at constant pressure with representation on various charts such as T-S, H-S. Properties of steam and use of steam table, Mollier chart, (Numerical based on properties) 2.2 Principles of steam generation in high pressure boiler, classification of boilers, Water tube boiler and fire tube boiler, Introduction of high pressure boiler Lamont, Benson, Loffler, Velox boilers 2.3 Boiler draught- natural & artificial, relative merits & demerits, list of boiler mountings and Accessories & its function	14

3. Vapour Cycle	1. Represent various vapour processes on P-V and T-S diagram. 2. Describe various vapour cycles. 3. Draw various cycles on P-V and T-S diagram.	3.1 Vapour processes:-Constant pressure, Constant temperature, constant volume, constant enthalpy, constant entropy process 3.2 Concept of Carnot cycle, Rankine cycle, P-V and T-S diagram of Carnot cycle and Rankin cycle.	04
4. Condensers & Cooling Towers	1. Apply Dalton's law to condenser. 2. Describe construction and working of condensers and cooling tower. 3. Calculate condenser efficiency, vacuum efficiency 4. State the effect of air leakage in condenser.	4.1 Dalton Law of partial pressure Functions of condensers, classification of condensers, Construction and working of jet and surface condensers, 4.2 Sources of air leakage and its effect, concept of condenser efficiency, vacuum efficiency(numerical based on efficiency) 4.3 Cooling Tower-Construction and working of forced, natural and induced draught cooling tower.	10
5. Steam Nozzle & Turbine	1. Define Mach number and critical pressure. 2. State the application of steam nozzles. 3. Describe the principle of working of steam turbine. 4. Compare Impulse and reaction Turbine 5. Describe the Methods to improve efficiency of turbine, 6. Describe necessity of Compounding of turbines	5.1 Steam nozzle: - Concept of Mach number and critical pressure, Continuity equation, types of nozzles, equation for exit velocity, Application of steam nozzles. Efficiency of nozzles.(no numerical) 5.2 Steam turbine: - Classification of turbines, Principle of operation, working of Impulse and Reaction turbine. Basic difference between Impulse and reaction Turbine, Methods to improve efficiency of turbine, Compounding of turbines. (No numerical)	14
6. Heat Transfer	1. Describe various modes of heat transfer. 2. Define various terminology used in radiation	6.1 Modes of heat transfer:-Conduction, Convection and radiation, Fourier's law. 6.2 Radiation;-Thermal radiation,Absorptivity,Transmissivity, Reflectivity,Emissivity,Black and Gray body	04
Total Hrs.			64

❖ LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignment	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	Basic Concept	02(00)	08(04)	06(06)	16(10)
02	Steam Generator	06(00)	04(06)	04(00)	14(06)
03	Vapour Cycle	00(04)	08(00)	00(00)	08(04)
04	Condensers and Cooling Towers	04(02)	10(00)	00(06)	14(08)
05	Steam Nozzles and Turbines	04(02)	04(04)	06(00)	14(06)
06	Heat Transfer	04(02)	00(04)	00(00)	04(06)
	Total	20(10)	34(18)	16(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	1	U	2	1	U	2	6	R	2	2	R	2	4	R	2	5/7
	5	R	2																
02	1	U	4	2	U	4	3	R	4	4	R	4	5	R	4				3/5
03	3	U	4	4	U	4	5	U	4	6	R	4	1	U	4				3/5
04	2	A	4	2	R	4	5	U	4	3	U	4	6	U	4				3/5
05	1	A	6	4	A	6	2	U	6										2/3
06	4	U	6	5	A	6	1	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:****For Mechanical Engineering:**

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	–	–	2	3	1	3	3	–
3	–	3	3	3	–	–	–	3	–	3	3	–
4	–	3	3	3	–	–	–	3	–	3	3	–
5	–	3	–	–	–	–	2	3	–	3	3	–
6	–	3	–	–	–	–	–	3	1	3	3	–

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

For Automobile Engineering:

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	–	–	2	3	1	3	–	–
3	–	3	3	3	–	–	–	3	–	3	–	–
4	–	3	3	3	–	–	–	3	–	3	–	–
5	–	3	–	–	–	–	2	3	–	3	–	–
6	–	3	–	–	–	–	–	3	1	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	Thermal Engineering: Engineering Thermodynamics and Energy Conversion Techniques	P.L. Ballaney, Khanna Publishers, 24 th Edition, Reprint 2011	10: 8174090312

2	Thermal Engineering	D. K. Chavan & G.K.Pathak, Standard Publishing House, 2 nd Edition, 2013	978-81-89401-20-7
3	Thermal Engineering	R.K.Rajput, Laxmi Publications (P) Ltd. 9 th Edition, 2015	9788131808047
4	Thermal Engineering	S.L. Somasundaram, New Age International Publisher, 1996	10: 8122409792 13: 978-8122409796
5	Thermal Engineering Vol. I (Thermodynamics And Heat Engines)	Dr. S.S. Khandare, Charotar Publishing House Pvt. Ltd., 2008	9788185594682
6	Thermal Science and Engineering	Dr. M.L.Mathur& Prof. F.S. Mehta, Jain Book Depot (JBD), 3 rd Reprint, 2013	9788183600835

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=aC7c1NgA-7M>, assessed on 23rd March 2016
- <https://www.youtube.com/watch?v=is5wdVgPOkI>, assessed on 23rd March 2016
- <https://www.youtube.com/watch?v=Wz62eqg0kqs>, assessed on 28th March 2016
- <https://www.youtube.com/watch?v=UW7Pm3kXJT8>, assessed on 28th March 2016

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

S.N.	Name	Designation	Institute / Industry
1.	Mr.O.V.Sarode	I/C HOD, Mechanical Engineering	Government Polytechnic Nagpur
2.	Mr.S.W.Rajurkar	Lecturer , Mechanical Engineering	Government Polytechnic Nagpur
3.	Mrs.M.D.Kothekar	Lecturer , Mechanical Engineering	Government Polytechnic Nagpur
4.	Mr.K.S.Thekedar	Lecturer , Mechanical Engineering	Government Polytechnic Nagpur
5.	Mr. Mahesh Khanna	Deputy Manager	Ashok Leyland Ltd. Bhandara
6.	Er. A.M.Onkar	Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
7.	Shri. G.F.Potbhare	Principal	NIT, Polytechnic, Nagpur
8.	Dr.S.S.Baraskar	Lecturer in Mechanical Engineering	Govt. Polytechnic, Arvi

(Member Secretary PBOS)

(Chairman PBOS)

LEVEL - IV

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE401E
COURSE TITLE	: AUTOMOBILE TRANSMISSION SYSTEMS
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	: 03 HRs
PR. TEE	: 02 HRs (External)
PT.	: 01 HR

❖ RATIONALE:

Automobile engineering technicians, being a professional who deals with a motor vehicle related activities during its life cycle should be thoroughly conversant with different Auto. Transmission system & all sub Systems associated. This is Advance Technology course that deals with construction and working of transmission system in general and its sub systems in particular that equip AET to deal with them satisfactorily The course aims to impart basic skills and understanding of automobile transmission systems basic components their working principle, classification and performance characteristics.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the knowledge of automobile transmission system.
2. Select various vehicle layouts and different types of drives.
3. Identify the various drive systems and their components.
4. Disassemble & assemble the components of transmission system.
5. Repair the Continuous Variable Transmission (CVT).
6. Detect the faults in clutches, gearboxes, differential and the wheels.

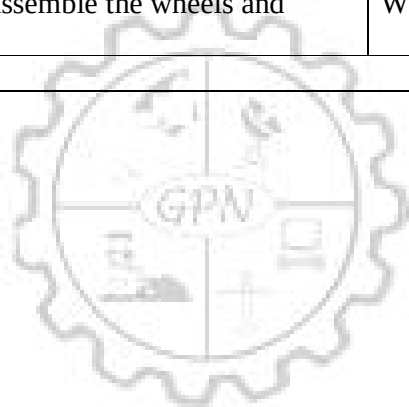
❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1. Introduction to Transmission system	1. State the need of transmission system. 2. Define vehicle layout. 3. Identify the transmission system components. 4. Describe the types of vehicle chassis with applications.	1.1 Need for Transmission system, Requirements of Transmission system. 1.2 Major assemblies- Locations and functions in brief. 1.3 Two and Four wheel drive systems, automated manual transmission. 1.4 Vehicle layout: 2 wheel drive layout, Rear wheel drive, front wheel drive, 4 wheel drive layout and all wheels drive layouts. 1.5 Types of chassis- fully forward, semi forward, and Truck or bus chassis.	07
2. Clutch	1. Apply the Principle of operation of the clutch. 2. State requirements of clutch. 3. Classify the clutch. 4. Enlist the Clutch lining materials. 5. Describe fluid coupling principle and operation.	2.1 Automotive clutch: Principle of operation, Necessity, General requirements. 2.2 Different types of clutches: Constructional details and Operation of single plate coil spring, diaphragm type, multiplate clutch, dry and wet type, Centrifugal clutch. 2.3 Clutch plate constructional detail and materials used for clutch lining. 2.4 Clutch control systems- mechanical, and hydraulic. 2.4 Fluid coupling -Principle, Constructional details and working.	08
3. Gear box	1. State the necessity of gear box. 2. Enlist the types of gear boxes. 3. Describe the Planetary gear box. 4. Define CVT. 5. Determine the Torque convertor working principle and construction.	3.1 Necessity of gear box, Determination of gear ratios. 3.2 Different types of gear boxes – Construction and working of Sliding mesh, Constant mesh, Synchromesh gearboxes, Need for double declutching, Transfer box, Planetary gear box, and Overdrive. 3.3 Gear shifting mechanisms-Gear lever on the top of gearbox. 3.4 Continuous variable transmission	10

		(CVT) – operating principle, and working. 3.5 Torque converter: Construction and working.	
4. Drive Line	1. Enlist the components of propeller shaft. 2. Describe the construction of Hooks universal joint. 3. Classify the CV joint. 4. Determine the effect of driving thrust and torque reaction.	4.1 Functions of Propeller shaft- universal joints slip joint and constant velocity joint. 4.2 Construction of Hooks universal joint, Rzeppa and Tripod joint. 4.3 Classification of CV Joint- inboard and outboard, plunging and non-plunging. 4.4 Effect of driving thrust and torque reaction. 4.5 Drive line arrangements – Hotchkiss drive and torque tube drive.	07
5. Final Drive	1. State the need of differential. 2. Determine the constructional details of differential. 3. List the Types of loads acting on rear axles. 4. Describe the types of rear axles. 5. Compare split and banjo type axle housings.	5.1 Purpose of final drive and drive ratio, Need of differential. 5.2 Constructional details of differential and working, Non-slip differential, Differential lock. 5.3 Construction of rear axles: Full floating, Three quarter floating and semi floating rear axles. 5.4 Types of loads acting on rear axles. Double reduction axles. 5.5 Types of axle housings- split and banjo type.	08
6. Wheels and Tyres	1. State the types of wheels and tyres. 2. Specify the tyres. 3. List the tyre materials. 4. Describe the effect of inflation pressure.	6.1 Constructional details: Parts of wheels, Types of rim. 6.2 Types of wheels and Tyres: Wire spoke, disc, and alloy wheels, Radial, Cross ply, Belted bias tyre, 6.3 Constructional details of pneumatic tyres, Specification of tyres. 6.4 Tyre material and desirable properties, tread patterns. 6.5 Effect of inflation pressure, Tyre rotation.	08
Total Hrs.			48

❖ PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw the various vehicle layouts and compare them.	Introduction to Transmission system	02
2	Disassemble & assemble the single plate clutch (light vehicle).	Clutch	04
3	Disassemble & assemble the synchromesh gearbox.	Gear box	04
4	Disassemble & assemble the automatic transmission.	Gear box	06
5	Disassemble & assemble the fluid flywheel or torque converter.	Gear box	04
6	Disassemble & assemble the drive line (universal joint, propeller shaft, and slip joint).	Drive Line	04
7	Disassemble & assemble the final drive & differential.	Final Drive	06
8	Disassemble & assemble the wheels and tyres.	Wheels and Tyres	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 Transmission system	00(02)	04(04)	08(00)	12(06)
02	Clutch	04(00)	08(00)	00(06)	12(06)
03	Gear box	04(02)	08(04)	06(06)	18(12)
04	Drive Line	02(00)	04(04)	00(00)	06(04)
05	Final Drive	04(04)	04(04)	06(00)	14(08)
06	Wheels and Tyres	02(00)	06(04)	00(00)	08(04)
	Total	16(08)	34(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	A	2	4	R	2	6	R	2	5	U	2	5	U	2	1	R	2	5/7
	3	R	2																
02	2	R	4	1	U	4	3	U	4	4	U	4	6	U	4				3/5
03	3	R	4	2	U	4	3	U	4	1	U	4	3	U	4				3/5
04	2	U	4	4	U	4	5	R	4	5	U	4	5	R	4				3/5
05	6	U	6	3	A	6	2	A	6										2/3
06	1	A	6	5	A	6	3	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	Identify parts like clutch, gear box, universal joints, propeller shaft, final drive, wheels & tyres.	10
2	Detect fault by observation & assembling.	20
3	Sketch the different devices. Handle tools, equipment, instruments.	10
4	Viva	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	3	3
4	-	3	3	3	3	2	2	2	2	3	3	3
5	-	3	3	3	3	2	2	2	2	3	3	3
6	-	3	3	3	3	2	2	2	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.	Automobile Engineering Vol.I	Dr. Kripal Singh, Standard Publishers, 13th Edition, 2013	97881801419669
2.	Automotive Mechanics	Crouse. W.H., Anglin, McGraw Hill Education (India) Private Limited, 10 th Edition, 2006	0070634351
3.	Automotive Mechanics	N. K. Giri, Khanna Publishers, Delhi, Eighth Edition, 2010	9788174092168
4.	Motor Automotive Technology	Anthony E. Schwalbe, Delmar Publisher Inc., 2 nd Edition, 1993	978-0827351004
5.	Automotive Mechanics	S. Srinivisan, Tata McGraw – HILL, 2nd Edition, 2003	9780070494916
6.	Basic Automobile Engineering	Nakra CP, Dhanpat Rai Publishing Company (P) Limited, 2009	9788187433224
7.	Automotive Mechanics	S. Srinivisan, Tata McGraw – Hill, 2 nd Edition, 2003	9780070494916

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=QPauJfA1KsY>, assessed on 30th June 2016
- <http://auto.howstuffworks.com/cvt.htm>, assessed on 30th June 2016
- http://www.carbibles.com/transmission_bible_pg3.html, assessed on 30th June 2016

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS**

1. Air compressor-1 HP 3 phase, Max Pressure: 4, 95 kg/cm², 70 ltr.
2. Engine Crane –Hydraulic, 2 ton Capacity.
3. Bottle/Floor/Scissor Jacks- 3 ton Capacity.
4. 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
5. Air hydraulic press - Capacity: 30 Ton. Air pressure: 100-140PSI. 2 Press plates included (designs may vary) Air inlet fitting: 1/4" NPT
6. Socket/ Impact wrenches- 1/4", 3/8", 1/2" and 3/4"
7. Torque wrenches- 3/8", 1/2" and 3 NM, Ratcheting type/Click-type.

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr.Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/AE/PK
LEVEL NAME	: ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES
COURSE CODE	: AM407E
COURSE TITLE	: STRENGTH OF MATERIAL
PREREQUISITE	: AM301E
TEACHING SCHEME	: TH:03; TU:01;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:

Concepts and principles involved in the analysis and design of various machines and machine components along with mechanical properties of engineering materials in Mechanical Engineering, Automobile engineering and Packaging technology are covered in this course. Design and analysis of machines and its components 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	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	08
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 and bending moment for determinate beams with load combinations of point	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 beams subjected to point loads and uniformly distributed loads only. 2.4 Point of maximum sagging and hogging bending moment, point of	08

	load and uniformly distributed load. 4 Differentiate shape of shear force diagram and bending moment diagram for point load and uniformly distributed load.	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.	08
4. Principal Planes and Stresses	1. Define terms related to principal planes and principal stresses 2. Calculate Principal Stresses & Principal Plane on a plane in a Strained structural Material 3. Calculate Principal stresses graphically by Mohr's Circle	4.1 Definition of principal plane, oblique plane. 4.2 State of stress at a point in two dimensional stress system, different states of stresses. 4.3 Mohr's circle, application of Mohr's circle. 4.4 Resultant stress, principal stresses – major and minor, position of principal planes	06
5 Columns, Direct and Bending Stresses	1. Define terms related with Columns 2. State end conditions of column 3 Define Effective length, radius of gyration, slenderness ratio Euler's buckling load 4. State Assumptions made in Euler's theory, Euler's buckling load 5 Calculated Crippling load by Eulers and Rankines Formula 6. Stresses of various structural components 7. Calculate direct and bending Stresses of a rectangular, square and circular column	5.1 Definition, short column, long column, type of end conditions for columns, Buckling of axially loaded columns.. 5.2 Effective length, radius of gyration, slenderness ratio, Assumptions made in Euler's theory, Euler's buckling load 5.3 Rankine's formula used for calculated crippling loads. 5.4 Concept of bending stresses, Equation of bending. 5.5 Concept of direct and eccentric loads Short compression member (Rectangular, square, circular sections) subjected to eccentric loads about any one or both the centroidal axis.	08

6.Thick and Thin Cylindrical Shell	1. State torsional equation and moment of resistance for circular shaft 2. State assumption made in theory of pure torsion 3 Calculate shear strength , torsional rigidity and polar modulus of circular and hallow shaft 4.Define thin, thick cylindrical shell, Circumferential and longitudinal stresses.. 5.Calculate Circumferential and longitudinal strain and stresses and volume due to internal pressure of cylindrical shell	7.1 Theory of torsion, Torsional equation, Moment of resistance, Assumption made in theory of pure torsion. 7.2Shear stress distribution across the section of circular shaft, strength of circular shaft, polar modulus 7.3Stresses in walls of thin cylindrical shells due to internal pressure, circumferential and longitudinal stresses 7.4Change in dimensions and volume of cylindrical shell due to internal pressure. 7.5Thin spherical shells, change in diameter and volume due to internal pressure (No derivation).	04
7.Torsion	1. State torsional equation and moment of resistance for circular shaft 2. State assumption made in theory of pure torsion 3 Calculate shear strength , torsional rigidity and polar modulus of circular and hallow shaft	7.1 Theory of torsion, Torsional equation, Moment of resistance, Assumption made in theory of pure torsion. 7.2Shear stress distribution across the section of circular shaft, strength of circular shaft, polar modulus	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	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.	1. Simple Stress And Strain	02
3	Operate Compression testing machine for compression test.	1. Simple Stress And Strain	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 HYSD steel.	1.Simple stress and strain	02
6	Perform Shear test on different metals.	1.Simple stress and strain	02
7	Perform Izod impact test.	1Strain Energy	02
8	Perform Brinell's hardness test.	1.Simple stress and strain	02
9	Perform Compression test on metals.	1.Simple stress and strain	02
10	Perform Flexure test on wooden and steel beam.	5.Direct and bending stresses	02
11	Perform Torsion In Circular Shaft	6.Torsion	02
GROUP C: LIST OF DRAWING SHEETS			
12	Draw shears force and bending moment diagrams of different types of beams and loadings. (Four problems on – Two A2 sizesheets.)	2 Shear force & bending moment	08
13	Draw Mohar's circle for Principal planes and stresses(Four problems on –Two A2 size sheet)	6.Principal stresses and planes	06
Skill Assessment			02
Total Hrs			32

C. LIST OF TUTORIALS:

Tutorials	
Numericals based on- Simple stress strain, Shear force and bending moment, Moment of Inertia	08
Numericals based on -Principal planes, Direct and bending, Thin cylinders, Torsion	08
Total Hrs.	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(02)	06(06)	04(00)	12(08)
03	Moment of inertia	02(00)	04(00)	00(04)	06(04)
04	Principal plane and stresses	02(00)	06(04)	00(00)	08(04)
05	Columns, direct and bending stresses	00(00)	06(04)	08(04)	14(08)
06	Thin and thick cylindrical shell	00(00)	08(00)	00(04)	08(04)
07	Torsion	00(00)	00(00)	06(04)	06(04)
	Total	10(04)	34(20)	26 (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
	2	R	2																
02	1	U	4	3	U	4	4	U	4	5	U	4	6	U	4				3/5
03	1	A	4	2	A	4	3	A	4	5	A	4	6	A	4				3/5
04	1	A	4	4	A	6	5	A	4	6	A	4	7	A	4				3/5
05	1	A	6	2	U	6	4	A	6										2/3
06	2	U	6	5	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		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 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)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	3	-	-
2	3	-	-	-	-	-	-	-	-	3	-	-
3	3	-	-	-	-	-	-	-	-	3	-	-
4	3	-	2	2	-	-	2	2	-	3	-	-
5	3	-	2	2	-	-	2	2	-	3	-	-
6	3	-	2	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	Strength of Materials, Vol. I: Elementary Theory and Problems	S. Timoshenko, CBS; 3rd edition , 2004	978-8123910307
2	Mechanics of Materials	Timoshenko Gere, CBS; 2nd edition, 2006	978-8123908946
3	Mechanics of Materials	R.C. Hibbeler , Pearson Education; 9th edition , 2013	978-9332518605
4	A Textbook of Strength of Materials	Dr. R.K. Bansal , Laxmi; Publications(P) Ltd. 5th edition, 2012	978-8131808146
5	Strength of Material	R. S. Khurmi., S. Chand & Co. Ltd.	978-8121928229
6	Strength of Material	S. Ramamurtham, Dhanpat Rai Publishing Co.	818743354X, 9788187433545
7	Mechanics of Structure Vol 1	S. B. Junnarkar and H. J. Shah, Charotar Publishing House Pvt. Ltd., 2012	978-9380358659
8	Strength of Material	Sunil S. Deo, Nirali Prakashan , 2013	978-9383073283

❖ E-REFERECNES:

- https://www.youtube.com/feature=player_detailpage, assessed on 28th Sep.2016
- https://www.youtube.com/watch?v=InEpKIYBkvk&feature=player_detailpage assessed on 28th Sep.2016
- https://www.youtube.com/watch?v=l20kF6fhScA&feature=player_detailpage assessed on 28th Sep.2016
- https://www.youtube.com/watch?v=RJXJpeH78iU&feature=player_detailpage assessed on 28th Sep.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.
- 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 confirming to IS:1757.
- Tile flexural testing machine confirming 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: venire caliper, meter scale, weighing balance, weights, punch, file, hammer, screw driver, pliers ,etc.

❖ 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. A.P.Waghmare	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
3.	Prof A.G.Bhaiswar	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 AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE402E
COURSE TITLE	: THEORY OF MACHINE
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	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

It is a core technology subject in Automobile Engineering Discipline. Automobile Engineers often come across various machines in practice. They should be able to identify and interpret various elements of machines in day to day life. In maintaining various machines, a diploma engineer should have sound knowledge of fundamentals of machine and mechanism. It will be helpful for them to understand the mechanisms from operational point of view in a better way. This subject imparts the kinematics involved in different machine elements and mechanisms like gear, cam-follower, follower, belt-pulley, flywheel, brake, dynamometer, clutch; etc. Detailed knowledge of these aspects with deep insight into the practical applications develops a professional confidence in them to become successful Engineer.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Determine various parameters of machine elements and mechanism.
2. Apply basics of Kinematics and Dynamics for different applications in routine life.
3. Identify possible failure in the machine elements.
4. Select Suitable Drives and Mechanisms for a particular application
5. Develop the skills and professional confidence to operate the machine
6. Utilize basic knowledge related to machine and mechanism to develop new one.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Fundamentals and Types of Mechanisms	1. Define various terms related to mechanisms 2. Describe inversion of chain. 3. Describe working of various mechanisms. 4. Give the application of the various mechanisms in automotive application.	1.1 Kinematics of Machines Definition of Kinematics, Dynamics, statics, Kinetics, Kinematic link, Kinematic pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine And structure. 1.2 Inversion of Kinematic Chain 1.2.1 Inversion of four bar chain, coupled wheels of Locomotive, Beam engine, Pantograph. 1.2.2 Inversion of single slider Crank chain –Pendulum pump, Rotary I.C. Engine mechanism. 1.2.3 Whitworth quick return mechanism, Scotch yoke mechanism, Oldham coupling	10
2. Velocity and Acceleration in mechanism	1. Define the term linear velocity, angular velocity, relative velocity and acceleration of the point. 2. Describe concept of relative velocity and relative acceleration. 3. Determine velocity and acceleration of different links in single slider crank mechanism by analytical method. 4. Draw velocity and acceleration diagram by relative velocity method.	2.1 Concept of relative velocity and relative acceleration of a point on a link, angular acceleration, inter-relation between linear and angular velocity and Acceleration. 2.2 Determine velocity and acceleration of different links in single slider crank mechanism by analytical method. 2.3 Draw velocity and acceleration diagram of a given configuration, diagrams of simple Mechanism. Determine velocity and acceleration of point on link by relative velocity method	08
3. Cam and Follower	1. Define terms related to cam. 2. Classify cam and follower 3. Describe construction of cam profile as per the given application.	3.1 Concept, definition and applications of Cams and Followers. Cam Terminology 3.2 Classification of Cams and Followers. 3.3 Draw profile of radial cam with knife-edge and roller follower	10

		with and without offset with reciprocating motion (graphical method)	
4. Power transmission	1. Define the terms related to belt drive gear drive chain drive. 2. Describe classification of Drives and selection of materials for various applications of drives. 3. Select Suitable Drives and Mechanisms for a particular application. 4. Calculate various quantities like velocity ratio, belt tensions, slip, angle of contact, power transmitted in belt drives.	4.1 Belt Drives- flat belt, V-belt & its applications, material for flat and V-belt. Selection of belts, angle of lap, length of belt, Slip and creep. Determine velocity ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical). 4.2 Chain Drives- Types of chains and sprockets, velocity ratio. Advantages & Disadvantages of chain drive over other drives, Selection of Chain & Sprocket wheels, methods of lubrication 4.3 Gear Drives – Classification of gears, Law of gearing, gear terminology. Types of gear trains, their selection for different applications. Train value & velocity ratio for simple, compound, reverted and epicyclic gear trains.	10
5. Brakes and Dynamometer	1. State function of brake and dynamometer 2. Describe construction and working of various brakes. 3. Describe construction and working of various dynamometers. 4. Calculate braking force, torque and power lost in friction in shoe and band brake	5.1 Function of brakes and Dynamometers, Type of brakes & Dynamometers 5.2 Construction and working i) shoe brake, ii) Band brake iii) Internal expanding shoe brake iv) Disc Brake 5.3 Construction and working of- i. Rope brake Dynamometer ii. Hydraulic Dynamometer iii. Eddy current Dynamometer. 5.4 Numerical problems to find braking force and braking torque and power for shoe and band brake.	05
6. Balancing	1. Describe the concept of balancing 2. Find balancing mass and position of plane, analytically and graphically.	6.1 Concept of balancing of single rotating mass 6.2 Analytical/Graphical methods for balancing of several masses revolving in same plane.	05
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Sketch and describe working of quick return mechanism for a shaper. Find the ratio of time of cutting stroke to the return stroke to understand quick return motion in shaping operation.	Fundamentals and types of mechanisms	06
2	Sketch and describe working of bicycle free wheel sprocket mechanism and Geneva mechanism	Fundamentals and types of mechanisms	04
3	Determine velocity and acceleration of various links of the given two mechanisms, by relative velocity method for analysis of motion of links.	Velocity and acceleration in mechanism	04
4	Draw the profile of a radial cam for the given follower type to obtain the desired follower motion..	Cam and follower	04
5	Determination of power transmitted by any belt drive using any one dynamometer converter.	Power transmission	04
6	Determine slip, length of belt, angle of contact in an open belt drive to understand its performance.	Power transmission	04
7	Dismantle and assemble mechanically operated braking mechanism of two wheelers. Sketch the two wheeler braking system and identify the functions of various components.	Brakes and dynamometer	02
8	Determine graphically balancing of several masses rotating in a single plane.	Balancing	04
Total hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER :

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Fundamentals and Types of Mechanisms	04(04)	10(04)	00(00)	14(08)
02	Velocity and Acceleration in mechanism	04(02)	04(04)	04(00)	12(06)
03	Cam and Follower	02(00)	04(00)	06(06)	12(06)
04	Power transmission	02(02)	04(08)	06(00)	12(10)
05	Brakes and Dynamometer	00(00)	08(04)	00(00)	08(04)
06	Balancing	04(00)	04(00)	04(06)	12(06)
	Total	16(08)	34(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	3	R	2	4	R	2	5	U	2	6	R	2	6	R	2	2	R	2	5/7
	4	R	2																
02	1	R	4	2	U	4	2	R	4	1	R	4	1	U	4				3/5
03	4	U	4	3	U	4	1	U	4	4	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	5	U	4	2	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	5	U	6	1	U	6	6	A	6										2/3

T = Unit/Topic No. L= Level of question M= Marks

R= Remember U= Understand A= 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	Identify different types of dynamometer and study their working	10
2	Study the Braking system of two wheeler	20
3	Study quick return mechanism for shaper machine	10
4	Viva.	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	3
2	-	3	3	3	3	1	1	1	-	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	3	-	-	-	1	3	3	3

1- Slight (Low) 2-Moderate (Medium) 3 –Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Edition and year of Publication	Publisher, ISBN Number
1.	Theory of Machines	Khurmi Gupta ,Eurasia publishing House Pvt. Ltd. 2006 Edition	8121901324,
2.	Theory of Machines	S.S Rattan Third Edition , McGraw Hill companies, II Edition 2013	13: 9780070144774
3.	Theory of Machines	P.L. Ballaney, Khanna Publication 2012	817409122
4.	Theory of Machines	Jagdishlal, Bombay Metro-Politan book limited 2010	10: 8120002725
5.	Theory of Machines	Sadhu Singh,Pearson 2013	9788131799789

6.	Theory of Machines	Ghosh – Mallik ,Affiliated East west press 2012	8185938938
7.	Theory of Machines	Thomas Bevan, Pearson 2010	8131729656
8.	Theory of Machines	J.E. Shigley, Oxford 2010	10: 0195371232

❖ **E-REFERENCES:**

- <http://nptel.ac.in/> , accessed on 9th July, 2016
- www.learnerstv.com , accessed on 9th July, 2016
- nptel.iitk.ac.in/ , accessed on 9th July, 2016

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

S.N.	Name	Designation	Institute / Industry
1.	Dr.K.S.Dixit	/C, Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Mr. J.M. Syed	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
5	Mr.S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
6	Mr.V.S.Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
7	MrK.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE403E^S
COURSE TITLE	: VEHICULAR SYSTEMS AND BODY
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (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:**

This course is one of the core technology course offered for Diploma in Automobile Engineering. This course introduces the students to various automobile systems like steering, suspensions, brakes and body engineering. This course is part of Automobile systems concerning safety, comfort and security of the vehicles. This course serves as a foundation for the subjects like Design of Automobile Component, Automobile Service Practice. Conceptual knowledge of this course is useful for understanding and improving the performance of Automobile systems.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply the knowledge of Automobile Systems in general practice.
2. Select control systems such as steering, braking and suspension for Automobiles.
3. Interpret the developments in body engineering, control systems and safety equipment.
4. Dismantle and assemble various system assemblies.
5. Identify parts of subassemblies and assemblies of various systems.
6. Prepare visit report on Automobile service station.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1. Front Axle and Steering	1. Define the terms related to steering geometry 2. State types of front axle and stub axle. 3. Describe Ackerman Principle. 4. Describe Construction and working of different steering gear boxes. 5. Describe Steering geometry and steering mechanism. 6. Draw layout of Power steering and describe its working.	1.1 Front Axle: 1.1.1 Types of front axle - Dead axle, live axle. 1.1.2 Type of stub axle arrangements- Elliot, reverse Elliot, Limousine, and reverse Limousine. 1.1.3 Front wheel assembly. 1.2 Steering system. : 1.2.1 Steering linkages. 1.2.2 Steering geometry and its effects – Caster, camber, king pin inclination, toe in- toe out, Correct Steering angle. Understeering and over steering, Turning radius. 1.2.3 Construction, working and application of Steering gear box – rack and pinion type, re-circulating ball type, and worm and roller type. 1.2.4 Ackerman Principle and linkage. 1.2.5 Power assisted steering and its types (Hydraulic, electrical and electronic)	12
2. Brakes	1. State Function and necessity of brakes 2. State classification of brakes and braking systems. 3. State Properties of brake fluid 4. Describe Construction and working of different braking system. 5. Describe Concept of antilock braking system. 6. Identify the type of braking system from the given diagram.	2.1 Introduction 2.1.1 Function and necessity of brakes. 2.1.2 Classification of brakes and braking systems. 2.1.3 Construction and working of -disc brake and drum brake 2.1.4 Friction materials used for brake shoes and pads. Characteristics of friction material- brake fade, coefficient of friction, dry friction and wet friction. 2.2 Braking systems 2.2.1 Construction and working of - Mechanical braking system, Hydraulic Braking system, Air braking system, Hydraulic operated air assisted braking system and vacuum assisted braking system. 2.2.2 Concept and working of antilock	12

		braking system. 2.2.3 Parking brake 2.2.4 Properties of brake fluids and their specifications.	
3. Suspension Systems	1. State the functions of suspension systems. 2. State the functions of Anti roll bar 3. State Types of suspension systems and its components. 4. Describe Concept of air suspension system. 5. Describe Construction and working of shock absorbers. 6. Distinguish between McPherson strut, and wishbone type Independent suspension 7. Describe selection of the suspension system with justification.	3.1 Suspension systems 3.1.1 Rigid and independent Suspension. 3.1.2 Types of Independent suspension system-McPherson strut, wishbone type. 3.1.3 Semi-elliptical Leaf spring, coil spring, torsion bar arrangement, 3.1.4 Construction and working of Air Suspension System. 3.2 Construction and working of Shock absorbers –Telescopic, Gas filled and hydraulic. 3.3 Anti roll bar or stabilizer bar.	10
4. Body Engineering and Safety Devices.	1. Definition and terminology of automobile body. 2. State the materials used for vehicular bodies. 3. Describe protective treatment of automobile body. 4. Describe working of various safety devices. 5. Justify why safety devices are used in automobiles.	4.1 Introduction to automobile bodies 4.1.1 Definition of body, terminology of a body, specifications of various vehicle body and comparison. 4.1.2 Types of bodies and body construction. 4.1.3 Automobile body materials, fabrication and accidental repairs. 4.2 Protective and anticorrosive treatments, painting and repainting procedure. 4.3 Safety devices –air bags, exhaust brake, emergency brake, central locking, Collapsible steering.	14
5. Car Heating Ventilation and Air Conditioning System (HVAC)	1. State basic principles of HVAC system. 2. List the refrigerants used in HVAC system. 3. State the properties of refrigerants used in HVAC system. 4. Describe comfort conditions of the occupants. 5. How will you control the	5.1 Fundamentals of Refrigeration and air conditioning. 5.1.1 Description of vapour compression cycle with components in the circuit. 5.1.2 Layout and operation of HVAC. 5.2 Type of refrigerants used in car air conditioning and their properties. 5.3 Human comfort conditions. 5.3.1 Temperature control system, humidity control.	08

	Temperature and humidity in automobile?		
6. Vehicle Performance	1. Define the terms related to vehicle performance. 2. Describe various resistances experienced by a vehicle. 3. Describe the effects of resistances on a vehicle. 4. Describe how Streamline shape of a vehicle body will improve the performance of vehicle. 5. Describe how Stability of vehicle on turn and slopes is maintained.	6.1 Resistance faced by the vehicle- Air resistance , rolling resistance, gradient resistance 6.1.1 Definitions- traction, tractive efforts, drawbar pull, gradeability and acceleration, surplus power, minimum power requirement. pitching, bouncing, rolling, sway and yaw. 6.2 Stability of vehicle on turn and slopes 6.2.1 Concept of Streamline shape of a vehicle body	08
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw sketches of different types of Front Axles through. Observation.	Front Axle and Steering	02
2	Dismantle and assemble the steering gear box. - Identify its type - Sketch its components - Observe the components.	Front Axle and Steering	06
3	Dismantle master cylinder, wheel cylinder and remove brake drum, identify and sketch the components and assemble it. - Observe and draw the layout of hydraulic braking system. - Observe and draw the layout of hydraulically operated air/vacuum assisted braking system	Brakes	06
4	Dismantle and assemble semi elliptical leaf spring, sketch its components with labels and describe its working. - Dismantle and assemble telescopic shock absorber, identify components and draw sketches of components with labels and describe its working. - Observe and sketch the construction of Mcpherson and wishbone type suspension with labels.	Suspension Systems	06
5	Draw the layout of HVAC system through observations. - Measure the ambient temperature and temperature at various locations inside the car. - Describe the control systems.	Car Heating Ventilation and Air Conditioning System (HVAC)	04
6	Visit to automobile service station of heavy vehicle to observe air suspension system, air brakes, power steering system and draw layout. Write a report	Industrial visit	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	Front Axle and Steering	04(04)	10(04)	00(00)	14(08)
02	Brakes	04(02)	04(04)	04(00)	12(06)
03	Suspension Systems	02(00)	04(00)	06(06)	12(06)
04	Body Engineering and Safety Devices.	02(02)	04(08)	06(00)	12(10)
05	Car Heating Ventilation and Air Conditioning System (HVAC)	02(00)	06(04)	00(00)	08(04)
06	Vehicle Performance	04(00)	04(00)	04(06)	12(06)
	Total	18(08)	32(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	3	R	2	4	R	2	5	R	2	6	R	2	6	R	2	2	R	2	5/7
	4	R	2																
02	1	R	4	2	U	4	2	R	4	1	R	4	1	U	4				3/5
03	4	U	4	3	U	4	1	U	4	4	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	5	U	4	2	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	5	U	6	1	U	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMRNT AND EVAULUATION 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 tools and equipment's.	05
2	Stepwise Procedure and Performance	20
3	Diagram	05
4	Conclusion and Result.	10
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	-	-	-	-	2	3	3	3
2	-	3	3	3	-	-	-	-	-	3	3	3
3	-	3	3	3	3	-	-	-	-		3	3
4	-	3	3	3	3	1	1	1	2	3	3	3
5	-	3	3	3	-	-	-	-	-	3	3	3
6	-	3	3	3	3	1	1	1	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.	Motor Automotive Technology	Anthony Schwaller, Delmar Publisher Inc., Second Edition, 1993	978-0827351004
2.	Automobile Engineering Vol. 2 Power Transmission	Anil Chikkara, Satya Prakashan, 2013	9788176841795
3.	Automobile Mechanics	Donald L Anglin, William H Crouse, Tata McGraw – Hill, Tenth Edition, 2006	9780028009438
4	Automobile Engineering Vol. I	Dr. Kirpal Singh, Standard Publishes-Distributors, 13 th Edition	13: 8180141969
5.	Automobile Engineering	R.B. Gupta, Satya Prakashan,	8176843792

		2015	13: 9788176843799
6	Automotive Technology	H M Sethi, Tata McGraw–Hill, 1991	9780074603901
7	Automobile Engineering Vol.I	R K Mohanty, Standard Book House, 2006	81-900893-5-9

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=raRNISeFBA&feature=youtu.be&t=00m00s> assessed on 15th September, 2016
- <https://www.youtube.com/watch?v=4R33KUGXGfU> assessed on 15th September, 2016
- <https://www.youtube.com/watch?v=ScVBPAitibQ> assessed on 15th September, 2016
- https://www.youtube.com/watch?v=bMg_j5_AGMg assessed on 15th September, 2016
- <https://www.youtube.com/watch?v=OXmlLidVli0> assessed on 15th September, 2016

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

1. Front Axle (FEFWD and FERWD Type)
2. Front wheel assembly for car and heavy vehicles.
3. Working model of automotive car air conditioning system (HVAC).
4. Steering Gear Boxes (Recirculating Ball type and Rack and pinion type).
5. Steering Linkages.
6. Suspension system. (Mc person, wishbone, Leaf spring and coil spring)
7. Telescopic shock absorber.
8. Model of air suspension system.

❖ **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. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur

8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Rasoni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE404E
COURSE TITLE	: AUTOMOBILE MANUFACTURING PROCESS
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	: 03 HRs
PR. TEE	: 02 HRs (External)
PT.	: 01 HR

❖ **RATIONALE:**

There are many advances in manufacturing processes and equipments with the advent of technology. The knowledge of these advances is essential for a diploma student engaged in manufacturing organizations. As an Automobile Engineering Technician, a pass out of this diploma programme, gets job either in assembly shop ACM or AM sector in Retailing, Servicing, and Repairs sector and as he/she is required to analyses function of assembly and failure of parts. Students should know basic & advance manufacturing process used.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify the advanced machining processes used in auto. manufacturing.
2. Select the different plastic processing methods.
3. Analyze the stages of manufacturing of metallic powder.
4. Perform the key way and gear cutting operations.
5. Apply the different surface cleaning and coating processes.
6. Use and operate the press for different operations.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1 Material Removal Process	1. Classify the lathe. 2. Describe different types of chips. 3. State the applications of Milling. 4. Differentiate between Lapping and Honing	1.1 Metal cutting operation: Mechanics of metal cutting, types of chips 1.2 Lathes and lathe work: Classification, Lathes operations. 1.3 Drilling Machine: Types, drill tools & applications 1.4 Milling machine: Types, milling cutters, applications 1.5 Grinding, Lapping, Honing: Machines, tools, & applications	10
2 Advanced Machining Processes	1. State the advantages of EDM. 2. Describe the AJM process. 3. List the applications of ECM	2.1 Electric-discharge machining (EDM) 2.2 Ultrasonic machining (USM) 2.3 Abrasive-jet machining (AJM), 2.4 Plasma arc machining (PAM) 2.5 Laser-beam machining (LBM) 2.6 Electrochemical machining (ECM) 2.7 Electron beam machining (EBM) (Machine tools, process and applications)	08
3 Plastic processing	1. Describe Extrusion of plastics. 2. State industrial applications of Transfer moulding. 3. Classify Injection moulding machines 4. Define Blow moulding.	3.1 Extrusion of plastics 3.2 Injection moulding – Plunger and screw machines 3.3 Compression moulding 3.4 Transfer moulding – Typical industrial applications 3.5 Blow moulding	07
4 Power Metallurgy	1. State various processes used in Production of metallic powder. 2. Enlist Advantages and Disadvantages of Power Metallurgy. 3. Describe designing of Power Metallurgy.	4.1 Introduction 4.2 Production of metallic powder 4.3 Processing methods 4.4 Advantages and Disadvantages and applications 4.5 Secondary operations	08
5 Surface treatment	1. Define tumbling. 2. Describe electroplating. 3. State the applications of galvanizing. 4. List the Surface finishing process.	5.1- Selection and use of Surface treatment and cleaning processes 5.2 Surface cleaning processes- Sand blasting, tumbling, alkaline, acid and electrolytic cleaning 5.3 Surface coating processes- electroplating, galvanizing, metal	08

		spraying, painting. 5.4 Surface finishing process- polishing, buffing, burnishing.	
6 Press shop process	1. Define Bending and forming. 2. Describe different types of Press. 3. Differentiate piercing & blanking. 4. List the Dies used in press.	6.1 Introduction 6.2 Sheet metal working: Bending, forming & deep drawing. 6.3 Difference between Punching, piercing & blanking. 6.4 Press - Types, construction & working. 6.5 Press tools-Dies, punches	07
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Perform different milling machine operations such as key way cutting or gear cutting by indexing in a batch of 4 students.	Material Removal Process	08
2	Prepare a report on injection moulding (Job should be selected from market utility).	Plastic processing	08
3	Prepare metallic powder using any one production method.	Power Metallurgy	06
4	Prepare industrial visit report on different surface treatment and surface finishing processes.	Surface treatment	06
5	Operate the Press for different operations with the Batch of 4 students.	Press shop process	04
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Material Removal Process	04(02)	08(08)	08(00)	20(10)
02	Advanced Machining Processes	02(00)	04(00)	06(06)	12(06)
03	Plastic processing	02(00)	06(04)	00(00)	08(04)
04	Power Metallurgy	02(00)	08(00)	00(06)	10(06)
05	Surface treatment	00(02)	04(00)	00(00)	04(02)
06	Press shop process	06(04)	04(08)	06(00)	16(12)
	Total	16(08)	34(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	A	2	2	R	2	3	R	2	4	R	2	6	R	2	1	R	2	5/7
	5	R	2																
02	1	R	4	1	U	4	2	U	4	1	U	4	6	U	4				3/5
03	6	U	4	4	U	4	5	U	4	1	U	4	6	U	4				3/5
04	1	U	4	4	U	4	6	U	4	3	U	4	6	R	4				3/5
05	3	U	6	2	A	6	4	A	6										2/3
06	1	A	6	6	A	6	2	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	Selection of equipment's. writing procedure etc.	20
2	Drawing block diagram,	10
3	Calculation, Result, (if any)	10
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	3	3
2	-	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.	Elements of Workshop Technology Vol. –I & II	S. K. HajraChoudhury A.K. HajraChoudhury Media Promoters, 1st South Asian Edition, 2009	8185099146, 9788185099149
2.	Production Technology	H.M.T., Tata McGraw-Hill Education, 1 st Edition, 2001	0070964432, 9780070964433
3.	Production Technology	R.K.Jain, Khanna Publishers, 17 th Edition, 2014	9788174090997
4.	Manufacturing Processes	B. H. Amstead, Phillip F. Ostwald, , Myron L.	0471842362, 978-0471842361

		Begeman, John Wiley & Sons, 8 th Edition. January 1987	
5.	Manufacturing Technology Vol. –II	Rao P N, Tata McGraw Hill Education Private Limited, 2 nd Edition, 2011	9780070087699

❖ **E-REFERENCES:**

- <http://www.learnerstv.com/video/Free-video-Lecture-7700-Engineering.htm> , assessed on 30th June 2016
- <http://nptel.ac.in/courses/112104028/>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=Y0dWIRfwZhc>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=HZW5ksBvkO8>, assessed on 30th June 2016

❖ **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.
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3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE405E
COURSE TITLE	: DESIGN OF AUTOMOBILE COMPONENTS
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	: 04 HRs
PR. TEE	: 02 HRs (External)
PT.	: 1 ½ HRs

❖ **RATIONALE:**

Automobile component design is applied technology subject , which requires knowledge of Mechanisms, strength of materials , Material sciences – Manufacturing processes and Mechanical engineering drawing. This subject deals with fundamental principles of machine design applied to automobile components. It also gives exposure to standard codes of practices and use of design data book.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Analyze the loads, type of induced stresses, resisting areas and modes of failure.
2. Analyze the forces/stresses acting on the element.
3. Design various general machine parts.
4. Use design data book
5. Identify and apply modes of failure and relevant theory of failure for problem solving.
6. Validate design of various auto parts.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1.Fundamentals of Design	1. Define design and state its classification 2. Describe the various considerations in design. 3. Describe different types of Loads and stresses acting on machine component. 4. Analyze Stress and Variable stresses in Machine parts 5. Describe Different types of theories of failure.	1.1 Design process:- 1.1.1 Introduction to design process and types of design. 1.1.2 Design considerations. 1.1.3 General procedure Used in Design of machine component. 1.1.4 Selection of material 1.1.5 properties of the material 1.1.6 Various engine and chassis components its material and manufacturing process. 1.2 Loads and stresses:- 1.2.1 Different types of loads and stresses 1.2.2 factor of safety and its selection 1.2.3 stress concentration causes and remedies 1.2.4 Fatigue and endurance limit, S-N diagrams for variable stresses and working stresses for static load, variable and fatigue load. 1.3 Elastic failure theories:- 1.3.1 Maximum principal stress theory, maximum shear stress theory and Distortion energy theory.	14
2. Design Of Joints.	1. Find induced stress and resisting area for various joints. 2. State the applications of joints in Automobiles. 3. Design various automotive joints.	2.1. Design of socket and spigot type cotter joint 2.2 Design of knuckle joint. and turn buckle. joint 2.3 Applications of above joints in Automobiles.	10
3. Design Of Shafts, Keys And Coupling.	1. State Types of shafts and Keys and its applications in automobile. 2. Design shaft, keys and couplings. 3. Describe concept of critical speed and whirling of shaft.	3.1 Shafts 3.1.1 Types of shafts 3.1.2 Design considerations of shaft 3.1.3 Design procedure for solid and hollow shaft 3.1.4 Design of propeller shaft, rear axle. 3.1.5 Concept of whirling and	12

		critical speed of shaft 3.2 Keys 3.2.1 Design of sunk keys 3.2.2 Effect of keyways on shaft strength. 3.3 Couplings 3.3.1 Design of couplings-Flange and Bush pin type flexible coupling.	
4.Design Of Levers And Springs	1. Identify various types of levers and its applications 2. Design Lever and Springs	4.1 Levers 4.1.1 Types of levers and its application in automobile 4.1.2 Design of rocker arm, bell crank lever. 4.2 Springs 4.2.1 Types of springs and its terminology 4.2.2. Design of helical springs, design of leaf springs, Spring materials 4.2.3 Concept of nipping in Leaf spring	10
5. Design Of Chassis Component	1. Calculate diameters of clutch plate 2. Determine Gear ratios and calculation of no of teeth. 3. Calculate dimension of semielliptical leaf spring 4. Design chassis components	5.1 Design of single plate and multi plate clutch using uniform pressure and wear theory 5.2 Gear ratios and teeth calculation of gears for sliding mesh / constant mesh gear box 5.3 Design of Semi elliptical leaf spring	08
6. Design Of Engine Components	1. Selection of IC engine as per application 2. Describe various loads acting on different components of engine and find out their dimensions. 3. Design engine components	6.1 Criteria for selection of engine. 6.2 Design of cylinder head thickness and calculation of cylinder dimensions for given power 6.3 Design of piston crown by bending strength and thermal considerations 6.4 Design of piston pin for bearing, bending and shear considerations 6.5 Design of connecting rod cross section and connecting rod small end.	10
Total Hrs			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify and classify different engine and chassis components according to type of load they are subjected its materials and manufacturing process.	Fundamentals of Design	04
2	Design of Cotter joint for specified data and prepare assembly detail drawings.	Design of Joints	04
3	Design of piston	Design of Engine Components	04
5	Design of Connecting rod	Design of Engine Components	04
6	Design of propeller shaft for specified data	Designs of Shafts, Keys and Coupling.	04
7	Design of single plate and multi plate clutch	Design of Chassis Component	04
8	Design of Leaf spring	Design of Chassis Component	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Fundamentals of design	00(02)	04(00)	00(00)	04(02)
02	Design of Joints.	06(02)	08(08)	06(00)	20 (10)
03	Design of Shafts, keys and Coupling.	02(00)	04(00)	06(06)	12(06)
04	Design of Levers and springs	02(00)	06(04)	00(00)	08(04)
05	Design of Chassis Component	04(04)	04(08)	06(00)	14(12)
06	Design of Engine Components	02(00)	08(00)	00(06)	10(06)
	Total	16(08)	34(20)	20(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	1	R	2	1	R	2	3	R	2	6	A	2	2	R	2	5/7
	1	R	2																
02	1	U	4	2	A	4	3	U	4	4	U	4	5	U	4				3/5
03	1	U	4	2	U	4	3	U	4	4	A	4	5	A	4				3/5
04	1	U	4	3	A	4	4	U	4	5	U	4	6	U	4				3/5
05	2	U	6	3	U	4	4	U	4										2/3
06	5	U	6	6	U	6	6	R	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	Identify different engine and chassis components	10
2	Calculate dimension of automobile components	20
3	Analysis of the different types of stresses acting on the elements and its failure analysis	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	3
2	-	3	3	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	3	3	3	3
6	-	3	3	3	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.	Elements of machine Design	V.B.Bhandari, Mc Graw Hill , 2014	0070681791
2.	A textbook of machine design	R.S.Khurmi, J.K.Gupta, S Chand Publication, 2013	13: 9788121925372
3.	Auto Design	R.B.Gupta, Satya publication New Delhi, 2013	9788176840101
4.	Automotive Mechanics	N.K.Giri, Khanna publication, 2015	8174092161
5.	Machine design	U.C.Jinad Pearson Education , 2016	9788131716595
6.	Shigley's Mechanical Engineering Design	Joseph Shigley, Charles Mischke, Richard G Budynas, Keith Je	13: 978-0073398204

		nisbett eight edition Mc Grew Hill,2013	
7.	Introduction to modern vehicle design	Julian Happian-Smith,. Butterworth hinemann,2011	9780080523040

❖ **E-REFERENCES:**

- <http://nptel.ac.in/syllabus/112105124> assessed on 9/08/2016
- www.learnerstv.com accessed on 9/08/2016
- <http://auto.howstuffworks.com/> accessed on 9/08/2016
- nptel.iitk.ac.in/ accessed on 9/08/2016

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE406E
COURSE TITLE	: AUTOMOBILE ENGINES
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 04(1TH/TU CREDIT =1 CLOCK HR., 1 PR CREDIT =2CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

This course is one of the core technology course offered for Diploma in Automobile Engineering. I C engines are required to run the vehicles. The basic principles of Thermodynamics are applied in I C engine. This course introduces the students to various parts of engines and systems like cooling, air, fuel, lubricating and exhaust. This course serves as a foundation for the subjects like Advanced Automobile Engines, Design of Automobile Component and Automobile Service Practice. Conceptual knowledge of this course is useful for understanding and improving the performance of Automobile Engines and will be helpful in finding and evaluating engine maintenance problems.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select the I. C. Engines as per requirements.
2. Interpret the developments in I. C. Engines and their systems.
3. Apply the methods to improve the performance of engine in terms of fuel economy, power output and zero emission.
4. Operate the I. C. engines.
5. Dismantle and assemble various systems of engines.
6. Identify parts of subassemblies and assemblies of various systems.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
01. Fundamentals of I.C. Engine	1. State applications of I C Engines. 2. State Merits and Demerits of Vertical and horizontal engines. 3. Write nomenclature of engine. 4. Classify I.C. engines and write their specifications. 5. Describe working principle of four and two stroke cycle engines. 6. Compare petrol and diesel engines, four stroke and two stroke engines.	1.1 Introduction, Definition of I C engine, Engine nomenclature. 1.2 The working principle of Engine 1.2.1 Four-Stroke Spark Ignition Engine. 1.2.2 Four-Stroke Compression Ignition Engine. 1.2.3 Comparison of Four-Stroke SI and CI Engine. 1.2.4 Two-Stroke Engines, Scavenging. 1.2.5 Comparison of Four-Stroke and Two-Stroke Engine. 1.3 Classification, Specifications and applications, Classification of engine on the basis of: Cycle of operation, Fuel, Method of Charging, Ignition, Cooling, Cylinder arrangement, camshaft layout. 1.3.1 Merits and Demerits of Vertical and horizontal engines. 1.3.2 Engine Specifications - Two Wheelers, Light Motor Vehicle, Medium Motor Vehicle and Heavy Motor Vehicle. 1.3.3 Applications of I C Engines.	09
02. Construction of I. C. Engine	1. State functions of Engine components. 2. State materials of Engine components. 3. Describe function, Construction and material of engine components. 4. Draw the diagram of engine components. 5. Describe valve mechanisms. 6. Draw Valve and port timing diagrams. 7. Justify the purpose of	2.1 Function, construction , materials and manufacturing methods of Engine components 2.1.1 Cylinder block, Cylinder liners – Dry and Wet, Cylinder head, Inlet and Exhaust manifold, Tappet cover, Timing cover, Crank case. Oil Sump. Crank Mechanism: Piston and piston rings, Piston pin, Connecting rod, Crank Shaft, Cam shaft, Flywheel, Bearings, Oil seals, Gaskets.	08

	different engine components.	2.1.2 Valve and Valve Operating Mechanisms: Overhead Valve and Overhead Cam arrangements. Valve Cooling. 2.2 Camshaft Drives and Valve Timing Camshaft drives: Timing Gears, Chain and Belt drive. Relation between speed of camshaft and crank Shaft. Valve timing Diagram, Port timing Diagram.	
03. Combustion chamber	1. Define the terms related to combustion chamber. 2. State types of combustion chamber. 3. Describe the SI and CI engine combustion chamber. 4. Compare various combustion chambers. 5. Identify type of combustion chambers.	3.1 Purpose, 3.2 Types- T, L, F, I head combustion chamber (CC), Wedge, hemispherical, Penta roof, Tub bath type CC, Combustion chambers of SI and CI engine, Pre and main CC 3.3 Comparison between various CC for disposition of various parts, volumetric efficiency, power, 3.4 Various key terms related to CC- Squish, turbulence and swirl movements, Quench volume, Surface to volume ratio, flame speed, 3.5 Importance of CC in modern automotive engines	08
04. Fuel and Air Feed System	1. State Need and requirements of Fuel Injection Systems 2. Define air fuel ratio. 3. Draw layout of fuel and air feed systems. 4. Describe the construction and working of Petrol and Diesel supply system. 5. Describe Working principle of governor. 6. Draw label sketch of fuel injector and FIP 7. Compare Petrol and Diesel supply system 8. Identify the given type of carburettor.	4.1 Petrol fuel supply system. 4.1.1 Conventional Petrol Engine: Gravity feed, Pump feed. 4.1.2 Construction and working of components: Fuel Tank, Fuel Filter, S. U. Electrical Fuel Pump, Air cleaners – dry type and Oil wetted types. 4.1.3 Working Principle of Simple Carburetor, Air Fuel ratio requirements, Circuits in Two-wheeler carburetor and Solex carburetor. 4.2 Diesel fuel supply system 4.2.1 Diesel Engine: Need and requirements of Fuel Injection Systems. 4.2.2 Layout of Fuel Injection systems – Individual pump, Unit injector system, Distributor system and Common rail system.	09

		4.2.3 Fuel Injector and types of nozzles. 4.2.4 Fuel metering in Fuel Injection Pump (Inline pump and Distributor pump) 4.2.5 Working principle of Mechanical Governor in Fuel Injection Pump.	
05. Ignition and Exhaust system	1. State Requirements of ignition system 2. State meaning of firing order of the engine. 3. Describe construction and working of ignition systems. 4. Compare various types of mufflers	5.1 Introduction to Ignition System 5.1.1 Requirements of ignition system. 5.1.2 Magneto and Battery Ignition systems 5.1.3 Firing order used in 3,4 and 6 cylinder engines 5.2 Types of Exhaust system 5.2.1 Function of Exhaust manifold. 5.2.2 Construction, Working and types of silencer / Mufflers.	05
06. Cooling and Lubrication systems	1. Identify components and types of cooling and lubrication systems 2. State Need of cooling system. 3. State Need of lubrication system 4. Classify Lubricating Oils 5. Describe construction and working of Cooling and Lubrication systems. 6. Describe construction and working of cooling and lubrication systems components. 7. Compare Cooling and Lubrication systems with justification. 8. Describe how positive crank case ventilation will improve the efficiency of engine.	6.1 Engine cooling system 6.1.1 Need of cooling system. 6.1.2 Limitations of cooling system. 6.1.3 Types: Air, Water/ Liquid cooling system 6.1.4 Properties of coolants and coolant additives 6.2 Construction and working of cooling system 6.2.1 Construction and working of: Thermostat valve, Water expansion tank, Temperature Indicators, Pressure cap, Water pump, Fan and fan belt. 6.2.2 Electrically driven Fan circuit. 6.2.3 Radiator: Construction and type of radiator cores. 6.3 Introduction to Lubrication system 6.3.1 Need of lubrication system. 6.3.2 Properties of lubricating oil, additives of lubricating oil. 6.3.3 Parts to be lubricated. 6.4 Types of Lubrication system 6.4.1 Types of lubrication system: Splash, Pressure – wet sump and dry sump 6.4.2 Components: Oil filters, Pump and its drive, pressure regulators, oil pressure gauge. 6.4.3 Positive crank case ventilation	09

		6.4.4 Classification of Lubricating Oils on the basis of Viscosity (SAE) and Load (API) Severity rating.	
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Operate Cut Section Engine Model To Understand Engine Nomenclature and Operate Engine.	Fundamentals of I.C. Engine	02
2	Identify and Observe Location Of Various Engine Components.	Construction of I. C. Engine	02
3	Remove the cylinder Head from the engine observe the components draw the diagram and refit it.	Construction of I. C. Engine Combustion chamber	04
4	Remove the carburetor from the engine of motor cycle, identify and check the components, draw the circuits and refit.	Fuel and Air Feed System	04
5	Open the fuel injection pump and fuel injector, identify the components – draw sketch and reassemble.	Fuel and Air Feed System	04
6	Dismantle Ignition System and Distributor Assembly, To Understand The Functions.	Ignition and Exhaust system	02
7	Remove the radiator from the vehicle, check it for leak, clean and reverse flush the radiator and refit. Remove the water pump, clean, inspect and refit.	Cooling and Lubrication systems	02
8	Remove the thermostatic valve, check and refit	Cooling and Lubrication systems	02
9	Dismantle and assemble oil pump, oil filter and pressure relief valve	Cooling and Lubrication systems	02
10	Dismantle and reassemble following types of engines. (Any one from each category) Moped/scooter/motorcycle, car/MuV/ Commercial vehicle	Complete curriculum	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	Fundamentals of I.C. Engine	04(04)	10(04)	00(00)	14(08)
02	Construction of I. C. Engine	04(02)	04(04)	04(00)	12(06)
03	Combustion chamber	02(00)	04(00)	06(06)	12(06)
04	Fuel and Air Feed System	02(02)	04(08)	06(00)	12(10)
05	Ignition and Exhaust system	02(00)	06(04)	00(00)	08(04)
06	Cooling and Lubrication systems	04(00)	04(00)	04(06)	12(06)
	Total	18(08)	32(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	3	R	2	4	R	2	5	R	2	6	R	2	6	R	2	2	R	2	5/7
	4	R	2																
02	1	R	4	2	U	4	2	R	4	1	R	4	1	U	4				3/5
03	4	U	4	3	U	4	1	U	4	4	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	5	U	4	2	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	5	U	6	1	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	Selection of tools and equipment's.	05
2	Stepwise procedure and Performance	20
3	Draw the diagram	05
4	Conclusion and Result.	10
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	-	-	-	-	-	-	3
2	-	3	3	3	3	3	1	-	-	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	3	-	-	-	-	3	3	3

Slight (Low) 2-Moderate (Medium) 3 –Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Automotive Engines	S. Srinivasan, Tata McGraw – Hill, Sixth Edition, 2008	978-0-07-040265-2
2.	Automobile Engineering Vol. I	Anil Chikkara, Satya Prakashan, 2014	9788176843515
3.	Automobile Mechanics	Donald L Anglin, William H Crouse, Tata McGraw – Hill, Tenth Edition, 2006	9780028009438
4	Automobile Engineering Vol.II	Dr. Kirpal Singh, Standard Publication	9788180141775
5.	Automobile Engineering	R.B. Gupta, Satya Prakashan, 2015	8176843792 13:9788176843799

6	Automotive Technology	H M Sethi, Tata McGraw– Hill, 1991	9780074603901
7	Automobile Engineering Vol.II	R K Mohanty, Standard Book House, First Edition, 2006	81-900893-5-10
8	Automotive Engines	James d. Halderman, Chase d Mitchell, Pearson Prentice Hall, Fifth Edition, 2008	81-317-0713-X
9	Internal Combustion Engines	H. N. Gupta, PHI Learning Pvt. Ltd., Second Edition, 2009	978-81-203-2854-9

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=OGj8OneMjek> assessed on 16/09/2016
- https://www.youtube.com/watch?v=y5p31F_dVJU assessed on 16/09/2016
- <https://www.youtube.com/watch?v=mmmcyj53TNic> assessed on 16/09/2016
- <https://www.youtube.com/watch?v=PIxIzZbNitE&list=PLkkALEBfIPuAGy3UScXO5XrIj9LLVybSi> assessed on 16/09/2016
- https://www.youtube.com/watch?v=QYx8J_5l5wY assessed on 16/09/2016

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

- 1) Two Stroke Engine Cut Section Model (Motorized/Manual)
- 2) Four Stroke Engine Cut Section Model (Motorised/Manual)
- 3) Two Stroke Engine single cylinder (Petrol/Diesel)
- 4) Four Stroke Engine single cylinder and multi-cylinder (Petrol/Diesel)
- 5) Fuel Supply system model for both petrol and diesel.
- 6) Model of Ignition system (Battery and Magneto).

❖ **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. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur

9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE407E
COURSE TITLE	: ADVANCED AUTOMOBILE ENGINE
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:

This course enables a candidate to understand advanced engine technologies. This is a need in current Indian auto market scenario. With shortage of conventional petroleum fuels, all alternative fuels and sources of energy are becoming increasingly popular, and significant. This course will enable candidate to understand the alternative energy sources and fuels of future. Understanding advanced engine technology will enable an engineer to test and service such engine.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Analyze the performance characteristics of SI and CI engines.
2. Apply the drive cycle for measurement of pollutants
3. Predict faults in electronic fuel injector, electric fuel pump and diesel electronic fuel injection system CRDe. MPFI.
4. Check pollutants emitted from S.I. and C.I. engines.
5. Maintain advance engines.
6. Diagnose advance engines

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Driving Factors for Advances in Engine	1. State standards and provisions of Emission norms 2. List the different emission measuring equipments. 3. Describe Technological advancement for increase engine performance and characteristics	1.1 Introduction . 1.2 Emission, Legislation, Comparisons of. Euro Norms and Bharat stage Norms. For different category of automobile engines (2W, LMV, HCV, petrol and diesel) 1.3 Equipment for checking Exhaust emission from vehicles 1.4 Technological advancement for increase Specific Power , reduce BSFC, reduce NVH , improved Torque & power characteristics.	06
2. S.I. Engine Advance Fuel System	1. State types of MPFI systems and their construction 2. Compare MPFI and Carbureted systems 3. Analyze relationship between input and output control functions of ECM. 4. Compare GDI with MPFI 5. Describe constructional features of the electronic control module	2.1 Comparison of MPFI and Carbureted systems 2.2 Multi-Point fuel Injection system (MPFI) Construction and working of injector, fuel rail and pump, 2.3 Inputs and outputs of electronic control module (ECM). 2.4 Output control functions- Fuel Injection control, Spark advance control, Idle speed control, Exhaust gas recirculation control and other controls 2.5 GDI Systems advantages & comparison over MPFI .	12
3. C.I. Engine Advance Fuel System	1. State features of electronic injection 2. Describe Construction and working of diesel fuel Injector 3. Fault Diagnosis of Common rail direct injection system	3.1 Construction and working of diesel fuel Injector 3.2 Electronically controlled rotary diesel Injection pump- working and construction 3.3 Construction & working of Common rail direct injection system 3.4 Construction & working of components of CRDI (low pressure fuel pump, high pressure fuel pump, diesel filter, injector, common rail and glow plug)	12
4. Advancement in Engines	1. Enlist alternate fuels and their properties 2. Compare conventional fuel	4.1 Comparison of Engine based on Conventional & Alternate fuels. 4.2 Fuel additives and their effects,	12

With Alternate Fuels	engine and alternate fuel engine 3. Explore possibility of retrofitting of alternative fuels system on conventional engine	Electric cars and hybrid vehicle 4.3 Alternative Fuels, Auto fuel system consideration, Alcohols Engine, Advancement with LPG Engine(Liquefied Petroleum Gas),Advancement with LNG Engine (Liquefied Natural Gas), 4.4 CNG Engine (Compressed Natural Gas), Bio Diesel.	
5. Engine Testing	1. State types of tests 2. State engine characteristics. 3. Define various engine parameters IHP, BHP and various efficiencies. 4. Describe procedure of Measurement of lubrication oil consumption 5. Compare engine performance. 6. Describe the heat balance sheet	5.1 Classification of Tests 5.2 Various characteristics of engine. 5.3 Fault finding tests (Vacuum & compression), Routine tests. 5.4 Measurement of IHP,BHP 5.5 Mechanical Efficiency thru Morse tests, thermal efficiency, relative efficiency. Volumetric efficiency/air consumption measurement. 5.6 Comparison of performance characteristics of Engines 5.7 Measurement of lubrication oil consumption. 5.8 Heat Balance.	10
6. Advancement in Ignition & Other Engine Systems	1 State effect of engine maintenance on exhaust emission 2 Describe gasoline and diesel engine emission 3 Fault diagnosis of emission control systems in diesel and gasoline engine	6.1 Effect of engine maintenance on exhaust emission 6.2 Gasoline engine emission control, Catalytic Converters. 6.3 Diesel emission, Diesel smoke and control 6.4 Exhaust-Gas recirculation (EGR) - EGR Valve and control 6.5 Positive crankcase ventilation (PCV) system 6.6 Evaporation emission control system 6.7 Turbocharger : wastegate type and variable geometry turbocharger 6.8 Control of detonation, pre-ignition surface ignition, Knocking etc.	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Diagnose engine condition from exhaust gas analysis to interpret results.	Driving Factors for Advances in Engine	02
2	Adopt recommended service manual procedure for testing MPFI system using service manual	S.I. Engine Advance Fuel System C.I. Engine Advance Fuel System	06
3	Identify components of MFFI and DFI system in Modern Auto. Engine & explain how they are connected in Engine.	S.I. Engine Advance Fuel System	03
4	Identify components of CRDI system in Modern Auto. Engine & explain how they are connected in Engine.	C.I. Engine Advance Fuel System 6 Advancement in Ignition & Other Engine Systems	03
5	Perform valve clearance adjustment, valve timing investigation and tappet setting of multi cylinder engine.	S.I. Engine Advance Fuel System 3. C.I. Engine Advance Fuel System	06
6	Perform diagnosis of electronic fuel injection system using diagnostic tester/ engine scanner.	Engine Testing	06
7	Perform vacuum test & Cylinder Compression check	Engine Testing	4
8	Locate components of air intake system, Turbocharger, Exhaust system, Evaporative emission, oil separator, EGR from modern vehicles.	Advancement in Ignition & Other Engine Systems	02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Driving Factors for Advances in Engine	02(00)	06(04)	00(00)	08(04)
02	S.I. Engine Advance Fuel System	04(02)	04(04)	04(00)	12(06)
03	C.I. Engine Advance Fuel System	02(00)	04(00)	06(06)	12(06)
04	Advancement in Engines With Alternate Fuels	00(02)	06(08)	06(00)	12(10)
05	Engine Testing	04(04)	10(04)	00(00)	14(08)
06	Advancement in Ignition & Other Engine Systems	04(00)	04(00)	04(06)	12(06)
		16(08)	34(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	3	R	2	4	U	2	1	R	2	6	R	2	6	R	2	2	R	2	5/7
	4	R	2																
02	5	R	4	2	U	4	2	R	4	5	R	4	5	U	4				3/5
03	4	U	4	3	U	4	5	U	4	4	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	1	U	4	2	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	1	U	6	5	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		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identification of systems and trace connections	10
2	Perform Diagnosis and setting	20
3	Calculation of results	10
4	Viva hose	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	2	3	3	3	3	3
2	-	3	3	3	3	3	2	3	3	3	3	3
3	-	3	3	-	-	-	-	-	-	3	3	3
4	-	3	-	3	3	3	-	3	3	-	3	3
5	-	3	3	3	3	-	-	3	3	3	3	3
6	-	3	3	3	-	-	-	3	3	3	3	3

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Motor Automotive Technology	Anthony Schwaller, Delmar Publisher Inc, 3 rd Edition. Yr 1999	13: 978-0827351004 10: 0827351003
2.	Automotive Service	Tim Gills, Delmar Publisher Inc. 5 th Edition. Yr 2016	10: 1305110595 13: 9781305110595
3.	Automobile Mechanics	Crouse / Anglin. TATA McGraw – HILL 6 th Edition Yr 2016	0070634351, 9780070634350
4	Automobile Engineering Vol-II	Kirpal Singh Standard Publication 3 rd Edition. Yr 2015	8180141772, 978-8180141775
5.	Automobile Engineering	R.B. Gupta Satya Prakashan N'Delhi, 3 rd Edition. Yr 2012	9788176843799
6	Automotive Mechanics	S. Srinivisan TATA McGraw – HILL 6 th Edition. Yr 2013	0070494916, 9780070494916
7	Automotive Technology	H M Sethi, TATA McGraw–HILL, 3 rd Edition. Yr 2010	0074603906, 9780074603901

❖ **E-REFERENCES:**

- http://energy.gov/sites/prod/files/2014/03/f10/ace033_toops_2012_o_0.pdf, assessed on 11th August, 2016
- <https://www.dieseln.net.com/standards/in/> assessed on 11th August, 2016
- www.springer.com/cda/content/document/cda.../9781447153245c1.pdf?SGWID...as assessed on 11th September, 2016

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

- MPFI engine , four cylinder.
- CRDI engine, four cylinder
- Emission test equipment's for multi gas
- Vacuum gauge for measuring port vacuum
- General tools and equipment's

❖ **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. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE408E ^S
COURSE TITLE	: AUTOMOBILE ELECTRICAL AND ELECTRONICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCKHR.)
TH. TEE	: 01 Hr. (Objective Type Online Examination)
PR. TEE	: 02 HRs (External)
PT.	: 15 MINUTES (Objective Type offline Examination)

❖ RATIONALE:

This course plays vital role in functioning of various systems of motor vehicle. Today majority of development in automobiles are taking place in field of automobile electrical and electronic systems. With the advancements in Auto field, electrical & electronics has become integral part of controlling systems. Further, it is assisting various other systems to become utmost efficient in their functioning.

This course introduces the students to various systems like charging, starting and Ignition. Microprocessors and Embedded systems are widely incorporated in modern vehicles. The knowledge of this course will help student to understand functions, application and maintenance of electrical and electronic circuits. It will also help the students to diagnose electrical and electronic components and systems.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select proper electrical and electronic components and systems for Automobiles.
2. Apply the basic knowledge of electrical and electronic systems in Automobiles.
3. Analyze the developments in electrical and electronic systems of Automobiles.
4. Identify the alternator components, starter motor components and understand test procedure of some of the components.
5. Conduct tests for Battery, alternator, starter, spark plug, distributor and spark plug cords.
6. Diagnose and repair the defects in the circuits, Know circuit protection devices.

COURSE DETAILS:**A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1 Automotive Electrical and Electronic Components	1. State the functions of switches, relays, fuses and solenoids. 2. State the purpose, operations and applications of various Automotive Electrical and Electronic Components. 3. Describe testing of simple circuit defects. 4. Describe construction and working of electrical accessories and Gauges.	1.1 Purpose and operation of electrical components and circuit protection devices. 1.1.1 Switches (SPST, SPDT, Ganged switch, mercury switch), 1.1.2 Relays, Solenoids, Buzzers, Resistors. 1.1.3 Fuses, Maxi fuses, Fusible links, Circuit breakers (Manual and automatic resetting types.) 1.2 Testing of circuit defects. Open circuit, Short circuit, Shorts to grounds, Voltage drop. 1.3 Working of Electromagnetic gauges and electrical accessories 1.3.1 Temp Gauges, Fuel gauge, Engine oil pressure gauge, Speedo-meter gauge. 1.3.2 Washer pumps, Blower motor. 1.3.3 Electro chromic mirror, Power seat, Power window	12
2 Automotive Battery	1. Identify components of automotive battery. 2. Define terms related to battery. 3. Describe maintenance free battery, Low maintenance battery, and Hybrid Battery. 4. Describe construction and working of batteries. 5. State procedure of battery charging. 6. Describe Battery maintenance and failures. 7. Describe the methods of battery testing. 8. Analyse the results of battery testing. 9. Justify jump starting.	2.1 Battery: Types and Testing 2.1.1 Construction and Working of following types: Lead acid battery, Maintenance free battery, Low maintenance battery, Hybrid Battery 2.1.2 Battery ratings and specifications. 2.1.3 Battery terminal test, Leakage test, Specific Gravity Test, Open circuit test, Battery drain test. 2.2 Battery charging and Jump Starting 2.2.1 Initial charging procedure, Slow, fast rate charging and trickle charging. Precautions during charging. 2.2.2 Concept of dry charged battery. 2.2.3 Jump starting-Procedure and	10

		precautions. 2.3 Factors affecting battery life and Battery failures 2.3.1 Cycle failure, internal short circuit, overcharging and sulphation. 2.3.2 Battery maintenance and safety precautions	
3 Starting And Charging System	1. Identify components of automotive starter and alternator. 2. Define various terms related to starting and charging system 3. Describe construction and working of starting system and charging system. 4. Describe Operation of charge indicator light circuit with simple wiring diagram 5. Describe the various tests of starter motor and alternator. 6. Analyse the results of tests of starter motor and alternator. 7. Analyse the diagnosis of rectifiers.	Part A: Starting System 3.1 Construction and working of starting system. 3.2 Types of starter drive: construction and working. • Bendix and overrunning clutch types only 3.3 Testing of starting system • Quick testing, Current draw test, Insulated circuit resistance test (voltage drop test), Ground circuit test, No crank test, free speed test Part B: Charging System 3.4 Construction and operation of alternator. Initial excitation and self excitation. 3.5 Alternator testing • Current output test, Field current draw test. Regulator output test, charging circuit resistance test (voltage drop test). 3.6 Alternator components testing • Rotor, Stator, Internal regulator and rectifier. 3.7 Regulation • Electronic, Computer Regulation circuit: layout and operation. 3.8 Operation of charge indicator light circuit with simple wiring diagram	14
4 Ignition System	1. Identify components of ignition system and know the functions. 2. State Need of ignition system. 3. Define various terms related to ignition system. 4. Describe construction and operation of modern ignition systems. 5. Describe Distributor less ignition system.	4.1 Conventional Ignition System- Need of ignition system, working of different components (ballast resistor, ignition coil, distributor, spark plug, cords and condenser). 4.2 Electronic ignition system- 4.2.1 Triggering of Primary circuit: Purpose, use of Transistor, Methods of triggering (magnetic pick up, Optical, Hall effect, HEI) 4.2.2 Electronic spark	10

	6. Compare various methods of triggering with justification.	timing (EST): operation and block diagram 4.2.3 Computer controlled ignition system: operation and block diagram 4.2.4 Distributor less ignition system: operation and block diagram.	
5Advanced Accessories and lighting system	1. State purpose and operation of advanced automotive accessories. 2. Define terms related to lighting system. 3. Describe construction and operation of advanced lighting systems. 4. Describe Construction and working of Sealed beam headlight. 5. Describe Park assists system. 6. Describe Automatic door lock system. 7. Describe Keyless entry system.	5.1 Purpose and Operation of advanced accessories 5.1.1 Automatic headlight dimming. 5.1.2 Automatic on/off headlight with time delay. 5.1.3 Keyless entry system 5.1.1 Common anti-theft system 5.1.5 Automatic door lock system. 5.1.6 Park assists system. 5.2 Construction and working of Sealed beam headlight. 5.3 Control of headlight beam, headlight dazzle, Antidazzle devices. 5.4 Need& types of Fog Lamps. 5.5 Types, construction & circuit of Side & Tail lights. 5.6 Necessity, construction & circuit of Autronic eye. 5.7 Necessity and wattages of parking lamp and reverse lamp.	08
6 Diagnosis of Electronic Components and Systems	1. What is OBD-II terminology? 2. State features of OBDII. 3. Describe construction and operation of various sensors. 4. Describe SAE J2012 standards Diagnostic Trouble Code(DTC) 5. Identify troubles using malfunction indicator signal or diagnostic tester. 6. Describe diagnosis of electronic sensors and actuators. 7. Analyse the diagnosis of electronic sensors and actuators.	6.1 Sensor construction, working and Testing • Oxygen sensor, Engine coolant sensor, Intake air temperature sensor, Throttle position sensor, Manifold absolute pressure sensor. Oil quality sensor, Absolute Pressure sensor, Vehicle Speed sensor, Mass airflow sensor, Knock sensor, Oil level sensor, Accelerator pedal position sensor, crank shaft position sensor, cam phase sensor, and Boost pressure sensor. Rail pressure sensor 6.2 Electronic fuel Injector testing (Sound test, Ohmmeter test only) . 6.3 Onboard diagnosis (OBD) • Purpose of onboard diagnostic	10

		second generation • Flash codes of Malfunction indicator light. • OBD II Concept, terminology: Drive cycle, Trip, Warm up cycle (Definitions only) 6.4 SAE J2012 standards Diagnostic Trouble Code(DTC) :-5 digits only	
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform following Battery Tests- • Specific gravity of electrolyte, • Load test, • Open circuit test.	Automotive Battery	04
2	Dismantle and assemble Starter Motor. • Identify Component • Draw the sketches. • Perform Starter current draw test and voltage drop test.	Starting And Charging System	04
3	Dismantle and assemble Alternator. • Identify Component • Draw the sketches.	Starting And Charging System	04
4	Perform following Alternator Tests- • Output test, • Regulated Voltage Output test, • Charging circuit resistance test.	Starting And Charging System	02
5	Perform electrical testing of rotor and stator of alternator	Starting And Charging System	02
6	Check ignition timing of a multi cylinder engine with strobe (neon light)	Ignition System	04
7	Inspect spark plug cords, Servicing of spark plugs and distributor.	Ignition System	04
8	Prepare industrial visit report: • Observe demonstration of on-board diagnosis of vehicular electronics system. • Record the procedure • Note down results	Diagnosis of Electronic Components and Systems	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	Automotive Electrical and Electronic Components	04(00)	10(00)	00(00)	14(00)
02	Automotive Battery	04(00)	04(00)	04(00)	12(00)
03	Starting And Charging System	02(00)	04(00)	06(00)	12(00)
04	Ignition System	02(00)	04(00)	06(00)	12(00)
05	Advanced Accessories and lighting system	00(00)	08(00)	00(00)	08(00)
06	Diagnosis of Electronic Components and Systems	04(00)	04(00)	04(00)	12(00)
	Total	16(00)	34(00)	20 (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	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	3	U	2	3	U	2	4	U	2	4	U	2	5	U	2	5	U	2
	5	U	2	5	U	2	6	U	2	6	U	2	2	A	2	2	A	2	3	A	2
	3	A	2	3	A	2	4	A	2	4	A	2	4	A	2	6	A	2	6	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
		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 tools and equipment's.	05
2	Stepwise procedure and Performance	20
3	Draw the diagram	05
4	Conclusion and Result.	10
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	-	-	-	-	3	3	3
2	-	3	3	3	3	-	-	-	-	3	3	3
3	-	3	3	3	3	1	1	-	-	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.	Automotive Technology: A System Approach	Jack Erjavec, Robert Scharff, Delmar Publisher Inc., Second Edition	9780827367241
2.	Motor Automotive Technology	Anthony Schwaller, Delmar Publisher Inc., Second Edition, 1993	978-0827351004
3.	Automobile Mechanics	Donald L Anglin, William H Crouse, Tata McGraw – Hill, Tenth Edition, 2006	9780028009438
4	Automotive Electricity, Electronics and Computer Controls	Barry Hollenbeck, Delmar Publishers, First Edition, 1998	978-0827365667

5.	Automotive Electrical Equipment	P. L. Kohli, Tata McGraw-Hill, 2006	0074602160
6	Automobile Engineering Vol.II	Dr. Kirpal Singh, Standard Publication,	9788180141775
7	Automobile Engineering Vol.II	R K Mohanty, Standard Book House	81-900893-5-9

❖ **E-REFERENCES:**

- https://www.youtube.com/watch?v=QYx8J_5l5wY , accessed on 16th September, 2016
- <https://www.youtube.com/watch?v=QqURbCfr2zs> , accessed on 16th September, 2016
- https://www.youtube.com/watch?v=bWeGIurg_tg , accessed on 16th September, 2016
- <https://www.youtube.com/watch?v=COJr7OB23Hw> , accessed on 16th September, 2016
- <https://www.youtube.com/watch?v=h9-6dkjMmQ4> , accessed on 16th September, 2016

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

1. Auto electric test bench.
2. Growler and armature tester.
3. Ignition coil tester.
4. Alternator.
5. Self-starter with solenoid and overrunning clutch..
6. Wiper motor three speed and four speed.
7. Distributor.
8. Battery charger for charging four batteries at a time.
9. Multimeter (digital and analog).
10. Timing light (stroboscope / neon light).
11. Battery load tester (capacity 500 A).
12. Clamp type ammeter. (capacity 500 A).
13. Battery Hydrometer.

❖ **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. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

4.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Rasoni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr.Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE409E
COURSE TITLE	: AUTOMOBILE SERVICE MANAGEMENT
PREREQUISITE	: Nil
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCKHR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

RATIONALE:

Comprehensive development that is taking place in motor vehicle in general has resulted in to changes in manufacturing and servicing practices being followed in respective sector. Further these two sectors, which were considered as isolate from each other, are getting more and closer and integrated. This is happening in order to achieve more and more customer satisfaction.

Customer Relationship Management (CRM) is new body of knowledge that is being practiced in modern workshops to not only make customer satisfied once but to convert him into lifelong customer of service centre.

An individual working with or aspiring to work in service network is therefore required to acquire requisite skills to follow CRM.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Justify importance of service management in automobile business.
2. Analyse the role of CSI, vehicle finance, sales and service in automobile business.
3. Develop various documents.
4. Prepare a detail project report on establishing a dealership.
5. Prepare service documentation.
6. Prepare a case for financing a four-wheeler

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hours
1.Introduction to Auto service industry	1. State and explain different types of service centers 2. Describe automobile manufacturers organization structure 3.State the various functions of a service division of the auto manufacturer	1.1 Growth of automobile service sector in India 1.2 Need and features of :- Dealership, Authorized service centre, Multi brand workshop, 1.3 Organization structure and function of a service division of auto manufacturer (OEM)	06
2.Dealerships organization	1. Enlist important personnel of a automobile service organization 2. Describe work profile of Dealers Service personnel	2.1 Organization structure of a dealership service function. 2.2 Work profile of Dealers Service personnel : general manager, works manager, service advisor, customer relations officer, service marketing manager, job controller, team leader, technical trainer, quality inspector, stores / spare parts officer and body shop manager	12
3.Customer satisfaction index (CSI)	1. Define CSI. 2. Describe Procedure & parameters of finding out CSI 3. State role of a dealership & company service division in improving CSI	3.1 Customer satisfaction index (CSI): meaning, importance, and agency. 3.2 Procedure & parameters of finding out CSI 3.3 Role of a dealership & company service division(OEM) in improving CSI	12
4.Service documentation & management information system	1. State importance of DMS 2. Describe the application of different documents mentioned in dealership 3. Develop a document for daily report of service centre	4.1 Dealership Management software (DMS)- Importance and structure 4.2 Formats & importance of information in following documents 4.3 Daily, weekly, monthly & yearly reports 4.3 Product performance report 4.4 Job card, warranty documents, service bulletin 4.5 Customer data, vehicle history	12
5.Vehicle financing	1. Enlist documents required for a vehicle financing 2. Define need and procedure of vehicle financing 3. Prepare a finances on	5.1 Vehicle financing : Need, types agencies, types, procedures, documents required, terms & conditions, EMI calculation, interest. 5.2 Valuation of pre-owned vehicle	12

	various parameters for pre-owned vehicle	Pre-owned vehicle financing.	
6. Service quality	1. State ways to improve service quality 2. Compare service quality standards for two wheeler and car servicing. 3. Plan pre monsoon free service camp	6.1 Service quality standards 6.2 Post service follow- up. 6.3 Door-step service, pickup & drop facility, Free Service camps 6.4 Service training	10
		Total	64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a detail project report on establishing a dealership for four wheeler or two wheeler. (Project report)	Service quality	04
2	Draw a layout of a service station for LMV/ cars consists of following:- (Layout Drawing) Plan, Elevation Layout, Height, Civil work Structure (brief), Ventilation, Illumination, vehicle parking, Waste disposal, Electrical, Painting, Security, Reception, Front office, Cash counter, Customer lounge, equipments , Spare parts section , Training room, Lubrication room, mechanical workshop- bays arrangement, Aggregate overhaul, Electrical overhaul room etc.	Dealerships organization	04
3	Fill information (mock) in following documents. Job card and warranty documents. (Documentation and records creation)	Service documentation& management information system	04
4	Prepare a case for financing a four-wheeler. (Finance case preparation)	Vehicle financing (hire purchase)	04
5	Visit a free service camp & prepare a report consisting of objective, procedure, activities, layout, expenses & role of various service personnel. (Understand procedure)	Service quality	04
6	Present service training & prepare a report.		04
7	Prepare a report on formalities and procedure of accident repairs. (Accident vehicle repair section)	Customer satisfaction index (CSI)	04
8	Prepare a report on the comparison amongst (i) two wheeler service(ii) car service (iii) heavy commercial vehicle service		04
Total Hours			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Auto service industry	02(00)	06(04)	00(00)	08(04)
02	Dealerships organization	04(02)	04(04)	04(00)	12(06)
03	Customer satisfaction index (CSI)	02(00)	04(00)	06(06)	12(06)
04	Service documentation & management information system)	00(02)	06(08)	06(00)	12(10)
05	Vehicle financing	04(04)	10(04)	00(00)	14(08)
06	Service quality	04(00)	04(00)	04(06)	12(06)
		16(08)	34(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	3	R	2	4	U	2	1	R	2	6	R	2	6	R	2	2	R	2	5/7
	4	R	2																
02	5	R	4	2	U	4	2	R	4	5	R	4	5	U	4				3/5
03	4	U	4	3	U	4	5	U	4	4	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	1	U	4	2	U	4				3/5
05	3	A	6	4	A	6	3	A	6										2/3
06	1	U	6	5	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	Performance	10
2	Presentation	10
3	Viva voce	10
4	Activity	20
	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
2	-	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	-	3	3	3	3
5	-	3	3	3	3	3	3	-	3	3	3	3
6	-	3	3	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.	Workshop Management systems	Tata Motors ltd. Yr. 2011	Nil
2.	Service quality standards	Maruti Suzuki ltd. Yr. 2015	Nil
3.	Customer relationship management	Roger Baran, CristopherZerres, Edition-1 Yr. 2014	978-87-7681-61
4.	Customer relationship management concept, strategy and tools	Springer Texts in business and economics- Edition 3 Yr.2012	978-3-642-20110-3
5.	Automotive Service management	Andrew A Rezin, 2 nd edition Yr. 2013	978-0132725408

❖ **E-REFERENCES:**

- ❖ <http://india.jdpower.com/press-releases/2015-india-customer-service-index-csi-study%E2%80%9494mass-market> assessed on 1stSeptember 2016
- ❖ <http://www.elvadms.com/industries/vehicle-service-management-system/> assessed on 1stSeptember 2016
- ❖ <http://www.iieom.org/paper/184%20Sayendra%20Sharma.pdf> assessed on 1stSeptember 2016

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

1. Nil

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	MrK.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Rasoni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AUTOMOBILE ENGG.

LEVEL NAME : PROFESSIONAL COURSES

COURSE CODE : AE410E

COURSE TITLE : HYDRAULICS AND PNEUMATICS

PREREQUISITE : NIL

TEACHING SCHEME : TH: 04; TU: 00; PR: 02(CLOCK HRS.)

TOTAL CREDITS : 05 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)

TH. TEE : 04 HRS

PR. TEE : 02 HRS (External)

PT. : 01 HR

❖ **RATIONALE:**

There is hardly any automobile as well as manufacturing industry and automobile service Station without Hydraulics and Pneumatics system. The diploma holders are required to work with those systems, their components and troubleshooting. This is core technology subject who provides knowledge of constructing Hydraulics and Pneumatics circuits and its applications to automobile industrial and mobile hydraulics and pneumatics. The subject requires the knowledge of Basic Engineering Science, Applied mechanics, Automobile Manufacturing Systems etc. This subject will be directly useful to the student in the industrial environment.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply basic properties of fluid, pressure measurement techniques, important Principles of hydraulics / Pneumatics with their applications and hydraulic/Pneumatic Devices used in practice.
2. Identify fluid power system components like Pumps, actuators, valve, filters, and to Construct the Hydraulic and Pneumatic circuits for various applications.
3. Suggest the suitable solution for the various faults of hydraulic and pneumatic devices.
4. Determine various performance parameters of hydraulic devices.
5. Dismantle and re-assemble hydraulic and pneumatic circuits and diagnose the faults.
6. Construct hydraulic and Pneumatic circuits.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Overview of Fluid Mechanics.	1 Define fluids and its properties 2 State types of fluid flows 3 Define pascals law 4 Describe principle used in hydrodynamics 5 Describe the procedure to measure Fluid pressure and measuring gauges.	1.1 Fluid Fundamentals. 1.1.1 Classification of Fluid, Properties of fluids like Specific Weight, Specific gravity, Surface tension, Capillarity, Viscosity. Specification of hydraulic oil 1.2 Pascal's law. 1.3 Types of fluid flow- Steady, unsteady, rotational, irrational, laminar, turbulent, one, two and three dimensional flow, Uniform and non uniform flow. (Definitions and applications only) Pressure Measurement. 1.4 Concept of atmospheric pressure, gauge pressure, vacuum pressure, absolute Pressure. 1.5 Pressure Gauges - Piezometer tube, simple and differential manometer, micro – manometer. (Theoretical Treatment only, No Analytical treatment / Problems on Manometers.) Bourdon tube pressure gauge. 1.2 Hydrodynamics 1.2.1 Basic principles of fluid flow 1.2.2 Law of continuity and its applications. 1.2.3 Energy possessed by the liquid in motion. 1.2.4 Bernoulli's theorem and its applications such as Venturimeter, Orifice meter and pitot tube. (Analytical treatment with derivation for measurement of discharge is expected). Hydraulic coefficients 1.2.5 Concept of Vena Contracta. 1.2.6 Coefficient of contraction, coefficient of velocity,	12

		coefficient of discharge, Coefficient of resistance. Relation between the hydraulic coefficient	
2 Hydraulic Devices	1 List the function of hydraulic pump 2 List the various parts of the pumps 3 Describe working of various types of pumps 4 List the factors on which Selection of proper pumping devices depends. 5 Suggest the suitable solution for the various faults of the pumps 6 List the Use of air vessel. 7 Compare reciprocating and centrifugal pump	2.1 Centrifugal Pumps. 2.1.1Types, Construction and working of centrifugal pump 2.1.2Types of casing. Need of priming. 2.1.3Heads, Losses and Efficiencies of Centrifugal Pump. (No Analytical Treatment.) 2.1.4 Net positive suction head 2.1.5 Fault findings and remedies and pump selection 2.2 Reciprocating Pumps 2.2.1Construction and Working of single and Double Acting Reciprocating pump. 2.2.2Positive and Negative slip. 2.2.3 Air vessels - their function and Advantage. 2.2.4 Power and Efficiencies of Reciprocation Pump. (No Analytical Treatment.) 2.2.5 Reasons of cavitations and separation. 2.2.6Comparison between Reciprocating and Centrifugal Pump	12
3Miscellaneous Fluid Machines	1. List the Functions of hydraulic device and pumping device 2. Describe working of other types of pumps 3. Describe working of other types of pumps	3.1 Simple Hydraulic Devices. 3.1.1 Working principles, construction and applications of Hydraulic jack, Hydraulic ram, Hydraulic lift, Hydraulic press. 3.2 Other Pumping Devices. 3.2.1 Gear pumps used in hydraulic circuits, Vane type, Swash plate type pump. Comparison of above pumps for various characteristics and their applications.	10
4 Basic Components of Hydraulic and Pneumatic Systems	1 Identify the various hydraulic and pneumatic symbols 2 Describe working of actuators and valves. 3 State the Application of hydraulics and pneumatics	4.1 Hydraulic and Pneumatic actuators. 4.1.1Hydraulic Actuators - Hydraulic cylinders (single, double acting and telescopic) – construction and working, Hydraulic motors(gear and	10

	actuator, Valves in the vehicle. 4 Describe the constructional features of the various valves	piston type) –construction and working 4.1.2 Pneumatic Actuators - Pneumatic cylinders (single and double acting) - construction and working, Air motors (gear and piston type) - construction and working 4.2 Valves for Hydraulic and Pneumatic systems. 4.2.1 Classifications of valves, poppet, ball, needle, throttle, pressure control directional control, sequencing synchronizing ,rotary spool, sliding spool Two position, multi position. Non-return valves. Proportionating valve 4.2.2 Construction and operation of above valves.	
5 Accessories of Hydraulic and Pneumatic Systems	1 State function of filters, hoses and gaskets 2 List the various types of pneumatic filters. 3 Describe Construction working of Filter, Hoses Seals and gasket 4 List the uses of gaskets and filters for automotive applications. 5 Suggest the suitable filter for the automotive applications.	5.1 Filters 5.1.1 Hydraulic filters and strainers – full flow and proportional types, function and working, difference between filters and strainers. 5.1.2 Pneumatic filters –screen type and mechanical type, function and working, FRL unit 5.2 Hoses and Connectors for hydraulic and pneumatic systems - Types, Construction and applications. 5.3 Seals and Gaskets for hydraulic and pneumatic systems-Types, function, construction, commonly used seals and gasket materials.	10
6. Hydraulic and Pneumatic Circuits	1 Trace the Basic & Industrial Circuit 2 Built various hydraulic and pneumatic circuits 3 Compare hydraulic and pneumatic circuits 4 List the applications of the hydraulic and pneumatics in the automotive applications	6.1 Hydraulic Circuits 6.1.1 Hydraulic symbols 6.1.2 Meter in, Meter out. Bleed off, Sequencing. 6.1.3 Introduction to electro-hydraulics – concept, principles and applications 6.1.4 Applications of hydraulic circuits – Hydraulic Cylinder, Safety in Operation Rams, PTO shaft 6.2 Simple Pneumatic Circuits.	10

		6.2.1 Pneumatic symbols 6.2.2 Speed control circuit (Meter in, Meter out), Sequencing. 6.2.3 Applications of pneumatic circuits – Air brake, Low cost Automation in industries, Pneumatic power tools (drill, hammer,	
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Verify Bernoulli's theorem by using Bernoulli's Apparatus.	Overview of Fluid Mechanics	06
2	Calculate the coefficient of discharge (C_d) of Venturimeter by using setup of convergent - divergent section	Overview of Fluid Mechanics	04
3	Determine overall efficiency of Centrifugal Pump & plot its operating characteristics by using Centrifugal pump test rig.	Hydraulic Devices	04
4	Dismantle and re-assemble reciprocating pump to identify components, functions of each component and prepare trouble shooting chart.	Hydraulic Devices	04
5	Construct various circuits using Hydraulic trainer.	Basic Components of Hydraulic and Pneumatic Systems	04
6	Construct various circuits using Pneumatic trainer.	Accessories of Hydraulic and Pneumatic Systems	06
7	Diagnose probable causes of failure of components of hydraulic and pneumatic circuits including power pack.	Hydraulic and Pneumatic Circuits	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Overview of Fluid Mechanics.	04(02)	08(06)	04(02)	16(10)
02	Hydraulic Devices	04(00)	04(02)	04(04)	12(06)
03	Miscellaneous Fluid Machines	02(00)	04(02)	02(00)	08(02)
04	Basic Components of Hydraulic and Pneumatic Systems	02(02)	06(04)	04(02)	12(08)
05	Accessories of Hydraulic and Pneumatic Systems	02(02)	04(02)	04(02)	10(06)
06	Hydraulic and Pneumatic Circuits	02(02)	06(04)	04(02)	12(08)
		16(08)	32(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	2	R	2	2	R	2	4	R	2	5	R	2	6	A	2	5/7
	6	R	2																
02	1	U	4	1	A	4	2	U	4	3	A	4	4	U	4				3/5
03	1	A	4	2	A	4	3	U	4	4	A	4	5	U	4				3/5
04	1	R	4	3	A	4	4	R	4	5	A	4	6	A	4				3/5
05	6	U	6	4	U	6	5	A	6										2/3
06	2	A	6	6	A	6	1	U	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESMENT 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	Identify device like manometer, discharge device, pump, hydraulic and pneumatic parts	20
2	Handle tools, equipment, and instrument.	10
3	Built up basic and industrial hydraulic and pneumatic circuit	10
5	viva	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	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	3
5	-	3	3	3	3	1	1	-	-	3	3	3
6	-	3	3	3	3	1	1	-	-	3	3	3

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

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Edition and year of Publication	Publisher, ISBN Number
1.	Hydraulic and Fluid Mechanics	Dr. S.M. Seth , Standard Book House, Delhi 2012	9788190089371
2.	Industrial Hydraulics	Pippengen and Hicks, Tata McGraw Hill Int.2013	81-203-1180-9 3.
3.	Introduction To Hydraulics And Pneumatics	S. Ilango and V.Soundararajan, PHI Learning Private Limited, New Delhi.2012	9788120344068
4.	Fluid Power	Anthony Esposito. PEARSON Education Noida 2012	9789332518544
5.	Engineering Fluid Mechanics	R.J. Garde and A.G.Mirajgaoker, SITECH Publications(India) PVT. LTD.	9788188429011
6.	Hydraulic and Pneumatic Controls	K. ShanmugaSundaram. S. Chand 2012	9788121926355
7.	Vicker's Industrial Hydraulic Manual	Vicker's system international Ltd.	9780615296418

	Pimpri,Pune – 411018	
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❖ **E-REFERENCES:**

- <http://nptel.ac.in/> accessed on 9/6/2016
- www.learnerstv.com accessed on 9/6/2016
- <http://auto.howstuffworks.com/> accessed on 9/6/2016
- nptel.iitk.ac.in/

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

1. Hydraulic Trainer
2. Pneumatic Trainer
3. Experimental set up to measure Discharge(Venturimeter,Orificemeter,Pitot tube)
4. Centrifugal pump, reciprocating pump.

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

S.N.	Name	Designation	Institute / Industry
1.	Dr.K.S.Dixit	, Head of Automobile Engineering	Government Polytechnic, Nagpur.
2.	Mr. R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr. Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr. A AOzarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
5	Mr. V.S.Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur
6	Mr. S.D. Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Rasoni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. AbhasDisawal	Enterpreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE411E
COURSE TITLE	: TRANSPORT MANAGEMENT
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 1 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

The different requirements of transportation are achieved by automobile manufacturing. This creates opportunities of providing service to the passengers and goods transport business. The service industry provides good opportunity for automobile diploma engineers as service engineer or other employment opportunities. The reputation, quality of service, convenience of scheduling, economics depends up on the true knowledge of motor vehicle act, working of different transport organizations, standard methods of record keeping, use of computers, and valuation of vehicles. By keeping some of the objectives in mind, the subject Transport Management is essential to learn.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Justify the need of Motor Vehicle Act and taxation.
2. Prepare various schedules for medium level transport organization.
3. Suggest different methods to improve the performance of transport industries.
4. Fill up the forms required as per Motor Vehicle Act.
5. Perform market survey and cost estimation.
6. Prepare small project reports regarding scheduling of bus / goods transport.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Motor Vehicle Act	1. Define the different terms related to vehicle. 2. State the age limit for drivers. 3. Perform the driving test. 4. Differentiate between STA & RTA 5. Describe taxation of Motor Vehicle.	1.1 M. V. Act 1988: Short titles used in MVA, Definitions, Terms regarding vehicle. 1.2 Licensing of Drivers of Motor Vehicle: Necessity, Age limit, Responsibility of owners, Restriction on holding a driving license, General, Preliminary test and driving test. 1.3 Conductor's license: Necessity, Eligibility, Documents required and rules for conductors. 1.4 Registration of Vehicles: Necessity, Where to be made, How to be made, temporary registration, Production of vehicle at the time of registration, Form and manner of display of registration mark, Size of Letters and numerals of registration mark, Transfer of Ownership of Motor Vehicle. 1.5 Control of Transport: Transport authorities, Difference between STA & RTA, Necessity of Permit, Different types of Permit, Transfer of permit, Temporary permit, Tourist permit, National permit. Speed limits. 1.6 Construction of Motor Vehicle: Overall dimensions, General provision regarding construction and maintenance of motor vehicle. Power of central government to make rules. 1.7 Insurance: Motor Vehicle Insurance, No-fault liability, Procedure for accident claim. 1.8 Taxation: Objectives, Basis of taxation, Methods of levying tax, Tax exemption.	10
2. Transport	1. Compare modes of transportation.	2.1 Modes of transport: Comparison of Road transport, Rail	08

Operation	2. State requirements of transport. 3. Describe basic elements of transport. 4. List the Passenger amenities.	Transport, Air Transport, Water Transport 2.2 Requirements of goods and passenger transport: On the basis of Volume, type, weight of material; class of passenger. 2.3 Basic elements in Transport Management: Market potential: Type of goods/ passengers, Period of use, Probable competition. Selection of vehicle: Type of load, Class of passenger, Type of service Organization setup: Govt., Semi Govt., Private. Legal compliance: Documents required as per MVA, Registration. Policies of transport organization: Policies towards passenger, employees, like Long distance service, Express service, Night service and others. 2.4 Layout of organization: Location, elements considered in location, Passenger amenities, infrastructure facilities. 2.5 Bus Rapid Transit System.	
3. Scheduling and Record keeping	1. Prepare bus Schedule. 2. Define different costs. 3. Describe the types of booking. 4. State use of computer.	3.1 Scheduling: Basic factors in bus, crew (staff) scheduling, calculation of number of buses. 3.2 Freight calculation: Time base, Distance base, Contract, per passenger, cubic feet tone method. Structure of fare, fixed cost- Maintenance cost, and depreciation cost, insurance, Interest on capital, variable cost, Hiring of trucks, Toll, staff wages, Miscellaneous cost. 3.3 Record keeping: Log book, Trip operational sheet, Vehicle ledger, and Truck history card, monthly Operational sheet, Goods consignment note, various types of bookings, Use of Computer.	07

4. Estimation and Valuation of Vehicle	1. Describe the procedure of survey. 2. Justify, How warranty system benefits to deal with Defects. 3. Identify the Points to check while buying a new vehicle. 4. State the factors to be considered when buying a used vehicle.	4.1. Role of surveyor: Procedure of survey and valuation of vehicle, Accident survey report. 4.2. Importance of warranty system and protection of law: How to deal with Defects, benefits of warranty system. Protection of law. 4.3 Buying a new vehicle: Factors to be considered - Ex-showroom price and on road price, use of vehicle, when and where to Buy, Closing the deal, Running in. inspecting the vehicle, Points to check: Test drive, Controls, Bonnet, Suspension, Switches, Seat, Noise, Ventilation, Safety, Boot, and Interior Storage. 4.4 Buying a used vehicle: When & where to buy: Dealers, used car firms, Private sellers, Garages, Auctions. Factors to be considered-- Depreciation, Model and year, Oil leak, Oil Pressure, Exhaust, Battery, Odometer, Bonnet, Crash damage, Rust, Suspension damage, Tyres, Switches & accessories, Lights, Chrome, Wiring, Steering, Hydraulic System, Structural corrosion, Floor, Test drive. 4.5 Preparations for selling: When to sell, How to sell, Auctions, Garages, Private sale, Preparing the car, Documentation, Selling price, Safeguards.	09
5. Motor Transport Industry	1. Describe the importance of automobile engineer. 2. Write the working of BEST. 3. Suggest different methods to improve the performance of MSRTC 4. State the role of various research organizations.	5.1 The Motor Transport Industry of India (Collection of Data of various companies) 5.2 Importance of Automobile Engineer in transport industry: Role of Automobile Engineer. 5.3 Working of Various State Transport Undertakings. MSRTC, BEST, PMT. 5.4 Functions & Role of Various Research Organizations in Automobile Industry:	08

		- Central Institute of Road Transport. - Automotive Research Association of India. - Vehicle Research, Development & Establishment. - Central Road Research Institute. - Petroleum Conservation & Research Association.	
6. Cargo and Logistics	1. Enlist the types of cargo. 2. Compare Cargo and Logistics. 3. Describe factors involve in Cargo Transport. 4. State the necessity of Logistics Department in Auto. OEM	6.1 Cargo: Types of cargo, Cargo's available in Transport Industries. 6.2 Importance of Cargo: Various factors involve in Cargo Transport, Cargo Transport in Automobile Industries. 6.3 Logistics: Concepts, definitions and approaches, factors influencing logistics. Supply chain – basic tasks. 6.4 Comparison between Cargo and Logistics. 6.5 Functions of Logistics: Necessity of logistics department in Auto.OEM. 6.6 Future scope of Cargo Transport in India.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Study, fill up, highlight the important points & prepare report on following forms under MV rules- a. Medical Certificate b. Learner's License c. Driving License d. Addition of License e. Renewal License f. Registration of Vehicle g. Transfer of Vehicle	Motor Vehicle Act	08
2	Perform market survey to purchase any one new vehicle.	Estimation and Valuation of Vehicle	06
3	Perform valuation for selling an old vehicle.	Estimation and Valuation of Vehicle	06
4	Prepare a report on Passenger Transport	Motor Transport Industry	06
5	Prepare a report on MIHAN, Nagpur.	Cargo and Logistics	06
			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Motor Vehicle Act	04(02)	08(08)	08(00)	20(10)
02	Transport Operation	02(00)	04(00)	06(06)	12(06)
03	Scheduling and Record keeping	02(00)	08(00)	00(06)	10(06)
04	Estimation and Valuation of Vehicle	06(04)	04(08)	06(00)	16(12)
05	Motor Transport Industry	02(00)	06(04)	00(00)	08(04)
06	Cargo and Logistics	00(02)	04(00)	00(00)	04(02)
	Total	16(08)	34(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	A	2	2	R	2	3	R	2	4	R	2	5	R	2	1	R	2	5/7
	6	R	2																
02	1	R	4	1	U	4	2	U	4	5	U	4	1	U	4				3/5
03	4	R	4	1	U	4	3	U	4	4	U	4	1	U	4				3/5
04	3	U	4	4	U	4	6	U	4	4	U	4	4	R	4				3/5
05	4	U	6	2	A	6	3	A	6										2/3
06	1	A	6	4	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

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❖ 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	Identify and selection of forms.	10
2	Prepare report, writing procedure etc.	20
3	Calculation, Result, Performance if any	10
5	Viva	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	2	2	3	-	-
5	3	3	1	1	3	1	3	2	2	3	-	-
6	3	3	-	-	3	1	3	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	Publisher/ ISBN Number
1.	Bus operation	Kitchin.L.D, ILLIFFE and Sons Ltd. London, 3rd Edition, 1952	B0007J9ZJ6
2.	Fleet Management	1 John Dolu, McGraw-Hill, 1984	978-0070174108
3.	The Motor vehicle Act 1988	Government Publication, 1989.	Ministry of Transport
4.	Bus and Coach Operation	Rex W Faulks, Butterworth-Heinemann, 1987.	9780408028103
5.	Supply Chain Management: A Global Perspective	Nada R. Sanders, Wiley; 1st Edition, 2011	978-0470141175
6	Development in supply chain Management	Nicole Gaiziunas, Viva books, New Delhi, 2012	9788130921585
7	Bus station Management	Dr. P. Sudarsanam, CIRT, Pune.	0970-4736
8	Urban Transportation: Planning, Operation and Management	S. Ponnuswamy, McGraw-Hill, 1st edition, 2012	9781259002731

9	Hand book of supply chain management	Ayers, J.B. The St. Lencie Press, 2000	978-1-4200-2570-5
10.	Handbook of Global Supply Chain Management	John T. Mentzer , Matthew B. Myers ,Theodore P. Stank, SAGE Publications, Inc, 2006	978-1412918053

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=40Z1AYkPW8U>, assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=u6T2qGtW6LY>, assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=TLCVuPInVJ4>, assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=yimJham2fEw> , assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=AwemFfdD6VI> , assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=MilQBxVjZAw&list=PLCD3E338A3E58E906>, assessed on 14th Sep 2016

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. AbhasDisawal	Enterpreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE412E
COURSE TITLE	: AUTOMOBILEENGINEERING DRAWING
PREREQUISITE	: AE301E
TEACHING SCHEME	: TH: 02; TU: 00; PR: 04 (CLOCK Hrs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE	: NIL
PR.TEE	: 04 Hrs (External)
PT	: NIL

❖ RATIONALE:

A Automobile engineer ,irrespective of their field of operation in an industry, is expected to possess a thorough understanding of drawing, which includes clear visualization of objects and the proficiency in reading and interpreting a wide variety of production drawings .Besides they are also expected to possess certain degree of drafting skills depending upon job function, to perform day to day activity i.e. communicating and discussing ideas with supervisors and passing on instructions to subordinates unambiguously.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret simple industrial drawings.
2. Interpret instructions related to manufacturing of components.
3. Use IS convention of representing various machine components.
4. Use limit, fits and tolerances.
5. Draw details Visualize and to Assembly
6. Visualize and draw details from assembly drawing

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Auxiliary views	1. Draw the projection of objects on auxiliary planes.	1.1 Auxiliary planes : Study of auxiliary planes, projection of objects on auxiliary planes .completing the regular views with the help of given auxiliary views(first angle method of projection)	04
2. Intersection of solids	1. Visualize and draw curves of intersection of the surfaces of different solids.	2.1 Prism with Prism and Cylinder with cylinder: When the axes are at 90° and intersecting and the axis are at 90° and offset 2.2 Cylinder with Cone:When axis of cylinder is parallel to both reference planes and cone resting on base on HP and with axis intersecting and offset from axis of cylinder	04
3. Representation Conventional	1. Draw the projection of conventional representation.	3.1 Standard convention using SP-46(1988). 3.2 Materials : C.I, M.S, Brass, Bronze , Aluminum , Wood ,Glass, Concrete and Rubber 3.3 Long and short break in pipe, rod and shaft 3.4 Ball and Roller bearing, pipe joints, cocks, valves, internal/external threads 3.5 Various sections: Half, removed, revolved, offset, partial and aligned sections 3.6 Knurling ,serrated shafts, splined shafts, and keys and keyways 3.7 Springs with square and flat ends, gears, sprocket wheel 3.8 Countersunk and counter bored holes 3.9 Tapers	04
4.Production Drawings	1. Define Limit, Fit, Tolerance, Geometric Tolerance 2. Interpret various symbols shown on the drawing and selection of manufacturing processes.	4.1.Limits, Fits and Tolerances: Definitions, introduction to ISO system of tolerancing-unilateral and bilateral and its representation on drawing, dimensional tolerances, elements of interchangeable system, hole and	06

	3. .	shaft base systems, tolerance diagram, selection of fit (clearance, transition and interference) for engineering applications 4.2. Geometrical tolerances: Definitions, Tolerances of form and position and its geometric representation-tolerance frame, datum feature, magnitude of tolerance and symbol, interpretation of given symbol on drawing, simple examples. 4.3 General welding symbols: Symbolic representation in engineering practices and its interpretation 4.4 Characteristics of surface roughness: indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods, using ISO code. Relation of surface roughness values with manufacturing processes	
5. Details to Assembly drawing	1. Visualize and Draw assembly details.	5.1 Introduction-Basic principles of process of assembly. 5.2 Couplings- Universal couplings and oldham's coupling 5.3 Bearing-.Foot step bearing and pedestal bearing 5.4 Tool post: Lathe(including square tool post), Shaper 5.5 Machine vice and pipe vice 5.6 Screw jack 5.7 Valves- Steam stop valve, Non-return valve 5.8 IC engine components assembly	08
6. Assembly to Details	1. Visualize and draw details from assembly drawing.	6.1 Introduction: basic principles of dismantling process 6.2 Pedestal Bearing 6.3 Lathe tail stock 6.4 Drilling jig. 6.5 Piston and connecting rod assembly, clutch, shoe brake. 6.6 Cross head and stuffing box assembly 6.7 Hydraulic ,pneumatic valves 6.8 Fast and loose pulley	06
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Use A3 size drawing sheet.			
1	Draw Auxiliary views of given object. (One sheet containing minimum two problems)	1. Auxiliary views	06
2	Draw intersection of solids (One sheet containing at least two problems)	2 intersection of solids	06
3	Draw Conventional Representation of machine components (one sheet) Interpret and draw Limit, Fit, Tolerances, geometric tolerances, Machining symbols, welding symbols (one sheet)	3 Conventional Representation	06
4	Interpret and draw Production Drawing of at least one automobile component. (one sheet)	4 Production drawing	06
5	Draw the given assembly and prepare component drawings, including conventional representation, tolerances and surface finish symbols. Prepare part list contained, name of components, quantity, material specification- one sheet	6.Assembly to details	08
6	Prepare an assembly with two views from a given drawings of components. Prepare a table containing name of component, quantity, material specifications and show overall dimensions of assembly.	5 Details to assembly drawing	12
7	Draw any two problems of assembly drawings (Assembly containing maximum 6 to 7 parts) on sketch book.	5 Details to assembly	10
8	Dismantle any machine assembly having 6 to 10 part and Prepare the sketches in sketch book with dimension and then draw assembly.	6 Assembly to details	10
Total Hrs			64

❖ **TABLE FOR SPECIFICATION THEORY PAPER:NA**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:NA**

❖ 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
		Drawing sheets		Continuous	05	--	Drawing sheets	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/ Interpret Conventional symbols	10
2	Draw Assembly / Production drawing	20
3	Draw details from assembly or Identify detail parts	10
5	Viva	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
4	-	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	Publisher/ ISBN Number
1.	Machine Drawing	N.D.Bhatt, Charotar Publication, 2010	9380358888
2.	Production Drawing	L.K.Narayan, New Age international, 2010	9788122435016
3.	Machine Drawing	N.Sidheswar, Tata McGraw Hill Education pvt Ltd, 2010	9780074603376
4.	Machine Drawing	N.D.Junnarkar, Pearson, Third impression 2011	9788123904016
5.	Machine Drawing With Autocad	Gautam Ghosh, Pearson, 2009	9780470547557
6	Machine Drawing	Basudeb Bhattacharyya, Oxford, 2011	9780198070771

❖ **E-REFERENCES:**

<http://nptel.ac.in/courses/> accessed on 8/6/2016

<https://en.wikipedia.org> accessed on 8/6/2016

<https://www.youtube.com> accessed on 8/6/2016

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COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AUTOMOBILE ENGG.

LEVEL NAME : PROFESSIONAL COURSES

COURSE CODE : AE413E

COURSE TITLE : COMPUTER AIDED DRAFTING

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 : NIL

PR.TEE : 04 Hrs (Internal)

PT : NIL

❖ **RATIONALE:**

Now a day manual drafting is obsolete in industry. Computers being the inevitable part in an engineer's life due to its inbuilt characteristics which helps him to do various task with acceleration. Using computers and Cad software it is easy to create and modify drawings ultimately it saves time. It also may be useful to generate assembly and manufacturing drawings. In mechanical industry operating skills are required for computer aided drafting operations of machine components, handling of printers and plotters. This subject is also useful to apply concepts in 3D modeling.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Draw, edit and modify 2D drawings.
1. Use dimensions, tolerances and geometrical tolerances.
2. Use basic command & Modify command
3. Draw isometric drawing and 3 D drawing
4. Export-import file in any software
5. Plot a 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	Use basics of CAD systems. Practical includes: • Introduction to computer aided drafting (CAD): Applications, various softwares for computer aided drafting. • Coordinate system: Cartesian and polar, Absolute, Relative mode • CAD initial settings commands: Snap, grid, ortho, osnap, limits, units, filters, itscale, mbuttonpan. • Object Selection methods: picking, window, crossing, fence, last, previous	1. Introduction to computer aided drafting	08
2	Use various Zoom and formatting commands Practical includes: • Zoom commands: all, previous, out, in, extent, realtime, dynamic, window, pan • Formatting commands: Layers, block, linetype, lineweight, color	2. Zoom and formatting commands	06
3	Draw 2 D drawings and measure length, area. Practical includes: • Draw command: Line, arc, circle, rectangle, polygon, ellipse, spline, block, hatch • Enquiry commands: distance, area	3. Draw and Enquiry commands	14
4	Use Edit and Modify commands Practical includes: • Modify command: Erase, oops, break, trim, copy, move, mirror, offset, fillet, chamfer, array, extend, rotate, scale, lengthen, stretch, measure, divide, explode, align. • Grips editing: Move, Copy, Stretch	4. Edit and modify commands	08
5	Apply dimensions, Write text or remarks and Plot drawing. Practical includes: • Dimensioning commands: Dimension styles, dimensional tolerances and geometrical tolerances	5 Dimensioning ,text and plot commands	12

	- Text commands: dtext, mtext command. - Plotting a drawing: paper space, model space, creating table, plot commands.		
6	Draw, modify 3 D drawings and Find material mass property. Practical includes: 3D Edit commands: pline, 3Dpoly, pedit, join, splinedit commands - View commands: View ports, UCS, WCS commands 3D Object and 3D operations: 3D Object - cube, cylinder, cone, sphere, wedge. 3D operations- extrude, revolve, 3D mirror, 3D move, 3D span, 3D rotate, 3D array, slice, sweep. - Boolean operations union, subtract, intersection. using isometric style option of snap command draw isometric drawing - Shade and Enquiry commands: mass property, shade and render command	6 Isometric and 3D drawings	16
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:NA**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:NA**

❖ 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	Use various command	10
2	Prepare drawing	20
3	Plot drawing	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.	AutoCAD: A Problem solving Approach	Sham Tickoo, Thomson Learning EMEA Limited, 2012	1942689004
2.	Mastering Auto CAD	George Omura, BPB Publication,	1119044839
3.	Basics of Auto CAD	George Omura, BPB Publication,	978-0-470-93234-6
4.	Machine Drawing with AutoCAD	Gautam Pohit & Gautam Ghosh, Pearson Publication	9788131706770.
5.	Engineering Graphics using AutoCAD	T Jeyapooan, Vikas Publishing House Pvt Ltd, Fifth Edition	9788125940005

❖ **E-REFERENCES:**

<http://nptel.ac.in/courses> accessed on 9th August, 2016

<https://en.wikipedia.org> accessed on 9th August, 2016

<https://www.youtube.com> accessed on 9th August, 2016

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7	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
8	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
9	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE414E^{\$}
COURSE TITLE	: VEHICLE DRIVING 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 EXAM	: NIL
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: NIL

❖ **RATIONALE:**

Driving skill enables Automobile Engineering Technician (AET) to test newly produced Vehicle as well as a vehicle whose servicing & repairs is carried out. Undertaking road test of a sample vehicle after it comes down from vehicle assembly line, a vehicle with complains a customer brings for repairs & servicing represents one of the important activities of AET. This practice ensures a auto manufacturer to delivery defect free vehicle & authorized entity to hand over complain free vehicle Keeping this fact in mind the department introduces this course at fifth level of the programme to provide requisite experiences at formative stages.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Prepare report on CMVR – 1989..
2. Identify Road signs.
3. Perform on driving simulator.
4. Drive a vehicle for which she/he is eligible as per MVA 1988.
5. Drive a vehicle based on Test of Competence prescribed in CMVR 1989.
6. Use defensive driving practices.

❖ **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.	Prepare brief report on Central Motor Vehicle Rule (CMVR) – 1989.	Introduction	02
2	Identify road signs and signals.	Road signs	04
3	Perform on driving simulator.	Driving simulator	10
4	Perform driving practice on LMV. - Operate/ judge steering - Operate vehicle controls such as clutch, gears, accelerator and brakes. - Identify and use dashboard controls	Vehicle controls	20
5	Perform vehicle driving practice on road for eligible candidates as per MVA 1988. - Advancing from stand still conditionings - Reversing in different situation - Cruising - Accelerating - Negotiating curved path with due care. - Keeping vehicle stand still on incline. - Over taking a vehicle with due care following traffic rules	Demonstration on road	20
6	Use defensive driving techniques on road, for eligible candidates as per MVA 1988 and conceptually for non-eligible candidates.	Defensive driving	10
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	40	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	10	--	Journal	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	Identification of road signs	05
2	Performance	30
3	Viva voce	15
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	3	3	3	3	3	3
2	3	3	3	-	-	-	-	-	-	3	-	-
3	3	3	3	-	-	-	-	-	-	3	-	-
4	3	3	3	3	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3	3	3	3
6	3	3	3	3	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.	MVA 1988	Ministry of surface, Transport & Highways, Govt of India Published by Govt. Press	
2.	CMVR 1989	Published by Govt. Press	
3.	How to drive?	TML CVBU,	

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

1. DLP Projector, latest specification
2. Driving Simulator.
3. Road sign charts.
4. Dual control vehicle.

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

S.N.	Name	Designation	Institute / Industry
1.	Dr. K.S.Dixit	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2.	Mr. R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Mr. Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Mr.V.S.Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
7	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
8	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
9	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
10	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES (PROJECT COURSES)
COURSE CODE	: AE415E
COURSE TITLE	: AUTOMOBILE SERVICE PRACTICE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 01; TU: 00; PR: 04 (CLOCK Hrs.)
TOTAL CREDITS	: 03(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: NIL

❖ **RATIONALE:**

Any vehicle to remain road worthy throughout its life needs after sales support viz. servicing & repairs. This fact was realized for the first time by US manufacture as per history of the Automobiles. With advent of customer satisfaction index (CSI) based rating of auto manufacturers the importance of automobile workshop has increased many fold over last few decades. Huge amount of all kinds of resources, as well as production & management techniques are being used extensively in them. AET being professionals who work in these repairs & servicing related entities, he/she should know systemically the way they work to transform their input into desired output.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify various types of auto workshop equipments.
2. Select most appropriate equipment for a target workshop.
3. Operate all auto workshop equipments.
4. Prepare a plan for vehicle maintenance.
5. Learn the maintenance of the vehicle.
6. Detect faults and the methods to rectify the faults.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Introduction to Automobile Workshop	1. List various activities of automobile workshop. 2. Describe the role of Garage, Service Station in automobile service industry.	1.1 Garage, Service Station and Specialist repair shop. 1.2 Activities of Auto w/s servicing, repairs, retailing. 1.3 Workshop safety.	02
2. General Auto workshop equipments	1. Identify and select various tools. 2. State functions of various tools.	2.1 Hand tools-Screwdrivers, Pliers, Hammers, Wrenches, Torque wrench. Files, Chisels, Taps & Dies, Drills, 2.2 Lifting equipment – Ramp, Floor jacks, Vehicle hoist, Axle safety stands, engine crane. 2.3 Washing equipment and Lubrication equipments	03
3. Special Equipments for a service station	1. Identify various components in Pneumatic circuits.	3.1 Pneumatic structure – Air Compressor, pneumatic line, end equipment, tools. 3.2 Press- hydraulic press, arbor press. 3.3 Measuring instruments.	02
4. Engine related workshop equipments	1. Identify various systems of workshop equipments	4.1 Engine analyzer, scanner. Exhaust gas analyzer. 4.2 Fuel injection pump test bench (phasing and calibration tests), Fuel injector testing. 4.3 Compression gauge, timing light, battery charger, Multimeter.	03
5. Chassis & Body related W/s equipments	1. Identify Chassis & Body related W/s equipments 2. State the functions of Chassis & Body related W/s equipments	5.1 Joining & finishing equipment-Oxy-Acetylene Torch, Arc welder, Soldering gun. 5.2 Tyre care equipment – Tyre changer, wheel balancing, Wheels alignment, rim straightening. 5.3 Denting & painting related equipments.	03
6. Reconditioning equipments	1. Select suitable reconditioning processes.	6.1 Engine related – Boring, milling, turning, Grinding, lapping, housing, Valve grinding.	03

		6.2 Brake related – Brake testing, Drum & disc boring & grinding. 6.3 Cleaning & degreasing related- Steam cleaner, Solvent Tank, Wire brushes, scrapers, Sealants and Lubricants..	
Total Hrs.			16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Follow safety precautions in automobile workshop.	Introduction to Automobile Workshop	04
2.	Start the vehicle by Jump (Jumpstart).	Introduction to Automobile Workshop	04
3.	Toe the vehicle.	.Introduction to Automobile Workshop	04
4.	Identify and use any three general auto workshop tools	General Auto workshop equipments	08
5.	Jack and Lift a medium vehicle	General Auto workshop equipments	04
6.	Use and identify three special tools and equipments of auto workshop	Special Equipments for a service station	08
7.	Use following instruments - i) Venier Caliper ii) Micrometer iii) Bore gauge iv) Dial gauge v) Filler gauge	Special Equipments for a service station	08
8.	Check the running problems and use the Multimeter.	Engine related workshop equipments	08
9.	Open and Fit any three bearings and tyres.	Chassis & Body related W/s equipments	08
10.	Select and replace the Gaskets, Sealants and Lubricants.	Reconditioning equipments	08
			64

❖ SPECIFICATION TABLE FOR THEORY PAPER: NA

❖ QUESTION PAPER PROFILE FOR THEORY PAPER: NA

❖ 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	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	Selection of equipment's.	10
2	Procedure and Performance	20
3	Conclusion and Result.	10
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	3
2	-	3	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	3
5	-	3	3	3	3	-	3	3	3	3	3	3
6	-	3	3	3	3	-	3	3	3	3	3	3

Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Workshop Practice	Bawa, Tata McGraw-Hill Education, 2 nd Edition, 2009	0070671192
2.	Motor Automotive Technology	Anthony E. Schwalle, Delmar Publisher Inc., 2nd Edition, 1993	978-0827351004
3.	Automobile Engineering	R.B. Gupta, Satya Prakashan, New Delhi, 2015	9788176843799
4.	Vehicle Maintenance and Garage Practice	Jigar A. Doshi, Dhruv U. Panchal, Jayesh P. Maniar, PHI Learning Private Ltd, 2014	8120349822
5.	Basic Automobile Engineering	Nakra Cp, Dhanpat Rai Publishing Company (P) Limited, 2009	9788187433224
6.	Workshop Practice	R.K. Rajput, Laxmi Publications, 2009	8131806146
7.	Automotive Mechanics	William H. Crouse, William Harry Crouse –Tata Mcgraw-Hill Education, 1982	0070634351

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=a3GskGe1mJg>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=xUlmx2SnxJ4>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=HQfh6AZxL08>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=yYexaLUp610>, assessed on 30th June 2016
- <https://www.youtube.com/watch?v=-mhhDiz3bwk>, assessed on 30th June 2016

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

- Work table with 4 Bench vices – 5 Nos.
- Spanner set (6 to 32 mm) and Adjustable spanner - 5 sets
- Special tools (Allenkey set, Feeler gauges and Pliers etc.) - 2 sets

❖ **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

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GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AUTOMOBILE ENGINEERING
LEVEL NAME : PROFESSIONAL COURSES
COURSE CODE : AE416E
COURSE TITLE : PROJECT
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:

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 - Innovation - Design & Fabrication - Improvement in Equipment - Maintenance - Repairs - Any recent topic related to mechanical 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	2
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	4
3	Perform Project work - Design a project - Fabricate the same	Project Work	4
4	Test Project work	Testing	6
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	Project Writing	4

	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		
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	6

❖ **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	1, 2, 3, 4,5,6
		Project diary		Continuous	10	--	project	1, 2, 3, 4,5,6
				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	100	40	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	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	3	3	3	3	3	3	3	3	3	3	3	3
2	3	3	3	3	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
5	3	3	3	3	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	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:**

- As per requirements

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

- As per requirements

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

S.N.	Name	Designation	Institute / Industry
1.	Dr. K. S. Dixit	I/c HOD	Government Polytechnic, Nagpur.
2.	S. D. Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	R. B. Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	J. M. Syed	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	V. S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	A. R. Yadgire	Lecturer in Automobile Engineering	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 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

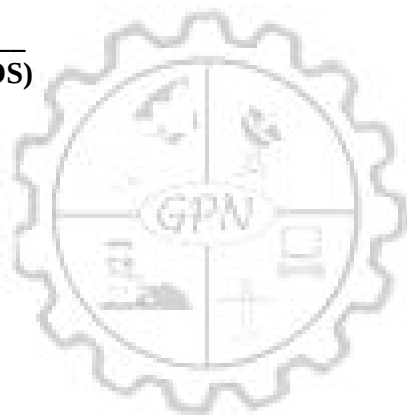
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- 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

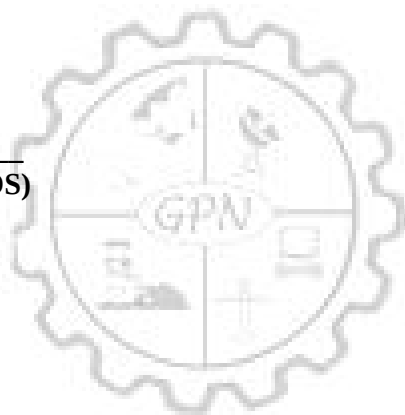
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

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- Computer, latest specification

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

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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 AUTOMOBILE ENGINEERING
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE501E
COURSE TITLE	: AUTOMOBILE INFOTRONICS
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:

Current Automotive Technology continuously changes day to day; students must know the current technologies related to advance electronics and trends in the vehicular communication and networks as vehicular active safety and performance enhancement concern. The basic aim of inclusion of this subject in this curriculum is to get awareness about the wide application of the internet and implementation of services such as Intersection Decision Systems (IDS), Automated Highway Systems (AHS), and Advanced Vehicle Safety Systems (AVS) and advanced electronics, systems, subsystems and its components.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the areas of applications of information technologies in the vehicular communication system.
2. Select suitable vehicle to vehicle and vehicle to infrastructure communication system
3. Analyze the requirements of the vehicular networking
4. Carry out maintenance of the various electronic accessories
5. Dismantle and assemble electronically operated systems and subsystems
6. Perform Engine System Self-Diagnosis (On-Board Diagnostics) and EOBD

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Infotronics: Vehicular Applications	1. List the advantages and disadvantages of Infotronics 2. List the important elements of the ECU 3. Describe roll of electronics in vehicular safety, traffic management, and emission reduction. 4. Describe constructional details of ECU. 5. Justify the use of ECUs and CCSs.	1.1 Application of electronics and computers 1.2 'Electronic systems' or 'computer controlled systems' 1.3 Electronic control units (ECUs) 1.4 ECU for fuel injection system. 1.5 Engine System Self-Diagnosis (On-Board Diagnostics) And EOBD	06
2. Sensors and Actuators	1. List the different types of Sensors and actuators 2. List the parameters commonly measured by the sensors 3. List the applications of various sensors and actuators in the vehicle 4. Describe the construction and working of the various types of sensors and actuators 5. Select various sensors and actuators.	2.1 Sensors: a means of providing information 2.2 Examples of different types of sensor 2.3 Obtaining information from analogue and digital sensor signals 2.4 Actuators: producing movement and other functions 2.5 Examples of different types of actuators 2.6 ECU/actuator control signals	10
3. Driveline Infotronics	1. List the various types of vehicle power train transmissions according to their principle of operations and construction 2. List the various types of sensors and actuators used in vehicular transmission 3. Describe necessity of driveline electronics 4. Draw a neat sketch of Power train control unit showing inputs and output 5. Draw a block diagram of Electronic control of transmission 6. Describe construction and working of different types	3.1History of electronic control 3.2Multiplexing 3.3Electronic transmission control as a black box 3.4Sensors and actuators used in transmission systems 3.5Clutch electronic control 3.6Manual gearbox electronic control 3.7Torque converter electronic control 3.8Automatic gearbox transmission management (epicyclic, fixed gear and CVT) 3.9Light hybrid powertrain technology (starter-generator) 3.10Electronic differential and four-wheel drive control	10

	of sensors and actuators used in automotive drive train. 7. Justify the use of electronic transmission system.	Transmission diagnostics 3.11 Future developments	
4. An Emerging Area of Vehicular Networks and data Exchange	1. List the various mode of vehicular communications 2. State the applications of various Universal Serial Port 3. Describe the working of vehicular network in the area of vehicle safety , traffic efficiency 4. Describe different vehicle to vehicle communication 5. Describe different vehicle to vehicle communication	4.1 Introduction 4.2 Car communications 4.3 Potential Applications • Safety • Traffic Efficiency • Driver Assistance • Infotainment 4.4 Potential Wireless Technologies • ZigBee • UWB (ultra-wide band) • Bluetooth Wireless USB (Universal Serial Port) • Wireless CAN	10
5. Drive by Wire Systems: Impact on Vehicle Safety	1. Define various terms related to drive by wire, Systems. 2. List out the various components used in the drive by wire system. 3. Describe working of various drive by wire systems. 4. Describe benefits and challenges of various drive by wire systems. 5. Justify the impacts of various drive by wire system on vehicle safety and drivers behavior.	5.1 Introduction 5.2 drive By Wire Systems: 5.3 current State of the art 5.4 Advantages of drive by wire system 5.5 Throttle By Wire Systems 5.6 Brake By Wire Systems • Electro-hydraulic (EH) BBW systems • Electromechanical (EM) BBW systems • Electromagnetic (EMg) BBW systems (Regenerative braking via electric generator or Eddy Current braking) 5.7 Steer By wire Systems	06
6. Automotive network Architecture for ECUs communications	1. List out different automotive networks. 2. List out applications of different automotive networks. 3. Describe working of the local interconnect network.	6.1 Introduction 6.2 Evolution of automotive Networking technology 6.3 The local interconnect network: LIN 6.4 The control area network: CAN 6.5 Power line communication (PLC) networks: an alternative Solution	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify various Sensors and trace its path. • Locate the sensor • Distinguish same sensors in different vehicles • Find out the its connections • Identify colour coding of the wires	Sensors and actuators	04
2	Identify various actuators and trace its path. • Locations of the sensor • Distinguish same sensors in different vehicles • Find out the connections • Colour coding of the wires • Pin assignment and tracking of the circuit	Sensors and actuators	04
3	Diagnose Engine System Set the vehicle for diagnosis procedure i.e operating conditions and modes • Connect Data Link Connector • Follow General Routine Procedure	Infotronics: Vehicular Applications	04
4	Perform removal and fitting task of electronic control unit / module • Locate ECM (In engine compartment and dashboard) and their constructional differences • Remove the ECM • Observe details of the ECM like connector, connector lock, pin assignment, location of atmospheric sensor • Identify the Input section , processor , output section and memory • Fitting procedure of the ECM	Infotronics: Vehicular Applications	04
5	Maintain Drive Train Electronics • Maintenance and Follow the precautions • Identify constructional changes in conventional system	Drive train Infotronics	04
6	Dismantle and Assemble Electronic clutch and Identify the components • Observe and sketch the components	Drive train Infotronics	04
7	Retrofit GPRS system in the vehicle	An Emerging Area of Vehicular Networks and data Exchange	04
8	Prepare a report on applications and use of various networking technologies and its interfacing with the vehicle		04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Infotronics Vehicular Applications	04(04)	06(08)	06(00)	16(12)
02	Sensors and Actuators	06(02)	08(08)	06(00)	20(10)
03	Drive train Infotronics	02(00)	04(00)	06(06)	12(06)
04	An Emerging Area of Vehicular Networks and data Exchange	02(00)	06(04)	00(00)	08(04)
05	Drive by Wire Systems: Impact on Vehicle Safety	02(00)	08(00)	00(06)	10(06)
06	Automotive network Architecture for ECUs communications	00(02)	04(00)	00(00)	04(02)
	Total	16(08)	36(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	2	R	2	3	R	2	4	R	2	1	U	2	5	R	2	2	R	2	5/7
	6	R	2																
02	2	R	4	1	U	4	2	U	4	2	U	4	2	U	4				3/5
03	1	R	4	2	U	4	3	U	4	4	U	4	1	U	4				3/5
04	5	U	4	6	U	4	5	U	4	1	U	4	1	R	4				3/5
05	4	U	6	2	A	6	3	A	6										2/3
06	3	A	6	1	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	Identification of components	10
2	Performance	30
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	-	-	-	-	-	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	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.	Hillier's Fundamentals of Motor Vehicle Technology Book 2 Power train Electronics	V.A.W. Hillier, Peter Coombes & David Rogers, Nelson Thornes Ltd	0 7487 8099 8
2.	Automobile Electrical and Electronic Systems	Tom Denton, Butterworth Heinmann	1136073825
3.	Automobile Electronics	Eric Chowanietz, Newnes, 1995	0750618787
4	Automotive Informatics and Communicative Systems: Principles in Vehicular Networks and Data Exchange	Huaqun Guo, Information Science Reference	978-1-60566-367-8

5	The book of informatics	John G. Gammack, Valerie Hobbs, Diarmuid Pigott	0170216004
6	Intelligent Vehicle Technology and Trends	Richard Bishop, Artech House, 2005	1-58053-911-4

❖ **E-REFERENCES:**

- <http://nptel.ac.in/syllabus/112105124>; accessed on 19th sept 2016
- <https://www.youtube.com/watch?v=6HTf2d6GWR8>; accessed on 19th sept 2016
- <http://in.mathworks.com/videos/interfacing-with-in-vehicle-networks-using-can-protocol-81607.html?requestedDomain=www.mathworks.com>; accessed 19th sept 2016
- <https://www.youtube.com/watch?v=rRaalFlejbk>; accessed on 19th sept 2016

❖ **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.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr.Abhas Disawal	Enterpreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

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

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: AE502E
COURSE TITLE	: AUTOMOBILE AERODYNAMICS
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (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:**

The industrial development in India has brought a great revolution in manufacturing of automobiles. Vehicles with an aerodynamic shape use less fuel. Air flows easily over them and less energy is needed to move them forward. The knowledge of Aerodynamics is essential for vehicle body design and performance. The aims of this course is to introduce the basic aspects of the Aerodynamic, Car body details, Wind tunnels, Vehicle Handling and to familiarize the students in Vehicle Aerodynamics.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply the concepts of fluid mechanics to reduce the lift and drag forces.
2. Analyze the aerodynamic drag and lift.
3. Apply the knowledge for the shape optimization.
4. Develop the aerodynamic shape for modern vehicles.
5. Check and test the vehicle shapes in wind tunnel.
6. Calculate the aerodynamic forces and moments.

❖ **COURSE DETAILS:**❖ **THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Basics of Vehicle Aerodynamics	1. Define vehicle aerodynamics. 2. Describe the historical development of vehicle aerodynamics. 3. Classify the vehicle aerodynamics. 4. State the Concept of airfoil and air dam.	1.1 Introduction: Historical development of vehicle aerodynamics, Future Scope and trends. 1.2 Fundamental of fluid mechanics - Aerodynamic variables. 1.3 Classification and practical objectives. 1.4 Flow phenomenon related to vehicle- External & Internal flow problem. 1.5 Concept of airfoil and air dam.	06
2. Aerodynamic Drag	1. State the types of drag force. 2. List the Aerodynamic properties. 3. Describe various vehicle moments. 4. Apply the Strategies to reduce the drag force. 5. Analyze the air Flow around a car.	2.1 Car as a bluff body, Flow field around a car - air flow pattern and pressure distribution. 2.2 Types of drag force - analysis of aerodynamic drag. 2.3 Strategies for aerodynamic development - low drag profiles. 2.4 Aerodynamic properties- lift and pitching, side force and yaw, rolling moment.	10
3. Shape Optimization	1. Define various terms related to car body construction. 2. Compare different car bodies. 3. Describe Front end modification. 4. Justify Add-on devices improves stability of vehicle.	3.1 Car bodies: Types of car bodies, Hatch back, fast back and square back. 3.2 Front and rear end modification - front and rear wind shield angle, A-pillar, roof, Boat tailing. 3.3 Dust flow patterns at the rear. 3.4 Gap configuration – Its effect and effect of fasteners. 3.5 Effect of add-on devices: limits of aerodynamic drag reduction.	10
4. Vehicle Handling	1. Define various terms related to aerodynamic stability 2. Describe Side wind problems. 3. Describe Water and Dirt accumulation on the	4.1 Aerodynamic stability-The origin of forces and moments on a vehicle. 4.2 Side wind problems- driving with trailer. 4.3 Water and Dirt accumulation on the vehicle.	08

	vehicle. 4. Identify the Wind noise sources in vehicles. 5. Describe effect of blind spot on visibility of driver.	4.4 Wind noise, wind noise sources in vehicles. 4.5 Concept of blind spot, Elimination of blind spot.	
5. Wind Tunnels	1. State the concept types of wind tunnel. 2. State various parameters assessed in wind tunnel testing. 3. Compare various wind tunnels. 4. Describe the types of test sections. 5. Justify wind tunnel testing.	5.1 Concept and construction of wind tunnel - Open and closed wind tunnels, climatic tunnel. 5.2 Existing wind tunnels-Large and small full scale wind tunnels, wind tunnel for scale models. 5.3 Types of test sections, measurement techniques. 5.4 Equipment and transducers. 5.5 Road testing methods.	08
6. Vehicle Performance	1. List the resistance faced by the vehicle. 2. Define Tractive effort and traction. 3. State the Relation between vehicle and engine speed. 4. Describe acceleration and gradeability. 5. Justify the effects various parameters on vehicle resistances.	6.1 Resistance faced by the vehicle during motion. 6.2 Power required to propel the vehicle, maximum draw bar pull. 6.3 Tractive effort and traction. 6.4 Relation between vehicle and engine speed, acceleration and gradeability. 6.5 Stability of vehicle on a slope and turn-Numerical methods.	06
Total Hrs.			48

❖ **LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Collect the information of historical aerodynamic cars and prepare a report.	Basics of vehicle aerodynamics.	08
2	Draw simple sketches of air flow pattern on various types of vehicle.	Aerodynamic drag	04
3	Design an aerodynamics shape with the help of graphics software.	Shape optimization	08
4	Prepare a report on visibility of different vehicles.	Vehicle handling	04
5	Calculate and Measure Aerodynamics forces and moments in wind tunnel.	Wind tunnels	08
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Basics of Vehicle Aerodynamics	00(02)	04(00)	00(00)	04(02)
02	Aerodynamic Drag	04(02)	08(08)	08(00)	20(10)
03	Shape Optimization	02(00)	04(00)	06(06)	12(06)
04	Vehicle Handling	02(00)	06(04)	00(00)	08(04)
05	Wind Tunnels	06(04)	04(08)	06(00)	16(12)
06	Vehicle Performance	02(00)	08(00)	00(06)	10(06)
	Total	16(08)	34(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	2	A	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

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	Drawing sketches	10
2	Writing procedure	1
3	Calculation and Results	20
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	-	-	-	-	-	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

S – Strong Relationship

M- Moderate Relationship

• **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Fundamentals of Aerodynamics	John D, Anderson Jr, 5th <i>Edition</i> , 2010 International student edition, McGraw Hill Co	0073398101
2.	Aerodynamics of Road Vehicles	Wolf – Heinrich Hucho, 1998, SAE.	978-0-7680-0029-0
3.	Wind Tunnel Testing,	Pope. A., 2nd edition, 1974. John Wiley & Sons, New York.	978-0-. 7680-0029-0, 1998
4.	Vehicle Aerodynamics	Sumantran. V, Gino Sovran, 1994, SAE.	9781560915942
5.	Vehicle body layout and analysis	John Fenton, Hutchinson, London, 1986	0852984456

• **E-REFERENCES:**

- <https://www.youtube.com/watch?v=yhBUK9WxIwI>, assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=eWTsXrPWl5Q> assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=YZ9yTahOMtE> assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=KW-mTdPYvFE> assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=EMJvEZ954pE> assessed on 14th Sep 2016
- <https://www.youtube.com/watch?v=MPD5kECKrbA> assessed on 14th Sep 2016

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

- Wind tunnels - Open and closed (models), 3*5 Feet,
- Climatic tunnel- wind chamber (models), Centrifugal blower,
- Vehicle models- Scale (models), full size
- Equipments-Transducers, anemometer
- Test chamber-Rolling road/mat(models), Speed-100 m/s

• **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.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr.Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: AE503E
COURSE TITLE	: CAD/ CAM
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRS.)
TOTAL CREDITS	: 04(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

1. RATIONALE:

It is a core technology subject in Automobile Engineering Discipline. Since last decade with the emergence of liberalization and globalization the Indian market has completely transformed from seller driven to buyer driven. With the entry of multinational companies in Indian market it has become necessary for Indian manufacturers to optimize and update their product designs continuously in order to make them cost effective and competitive. The market scenario coupled with rapid developments in computer hardware and software has led to emergence of CAD/CAM as powerful tool.

2. COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply fundamentals & use CAD.
2. Develop CNC part programming by using various codes.
3. Identify various parts of the CNC machines.
4. Use Pro-E or Higher version of CAD software.
5. Perform various operations on CNC machines.
6. Prepare a visit report on industrial automation.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Introduction to CAD/CAM	1. Define CAD and CAM 2. Describe conventional product cycle 3. State the applications of CAD/CAM. 4. State the advantages and disadvantages of the CAD CAM.	1.1 Role and need of computers in Industrial manufacturing 1.2 Conventional product cycle 1.3 CAD/CAM Hardware Basic structure, CPU, Memory, Input output devices, Storage devices and System Configuration 1.4 Advantages of CAD/CAM	06
2. Geometric Modelling : Surfaces and Solids	1 Define Modelling 2 Describe different types of modelling 3 Describe constructive solid geometry 4	2.1 Introduction to Modeling 2.2. Geometric Modeling - Salient features of Geometric models 2.3 Methods of Geometric Modeling - Wire-frame Modeling - Surface Modeling 2.4 Solid Modeling 2.5 Entities, Primitives 2.6 Constructive Solid Geometry 2.7 Boundary Representation 2.8 Feature based Modeling	10
3. Introduction To Computer numerical control	1 State the function of CNC, NC and DNC Machine 2 Describe different types of motion control system 3 State the applications of NC, CNC and DNC. 4. Justify, CNC machines improves Machining performance.	3.1 Introduction to NC, CNC, DNC, Advantages of CNC, Coordinate system in CNC 3.2. Types of Motion control System - Point to Point, Straight line, Continuous Path - Absolute system and incremental system - Feedback control system, Application of CNC	10
4. Part Programming	1 Develop Part programming by using G and M codes 2 List out G and M codes 3 Describe importance of Manual part programming. 4. Develop the CNC Programme for various machining operations.	4.1 Introduction to Part Programming 4.2 Terminology used in part Programming 4.3 Input data in Manual Part programming - Sequence Number (N Code) - Preparatory Functions (G Codes) - Feed Function (F)	08

		• Spindle Speed Function (S) • Miscellaneous Function (M Codes) 4.4 Formats of Manual part programming 4.5 Computer aided part programming (APT)	
5.Industrial Robotics	1 State the function of Robotics. 2 Identify Physical Features, Anatomy of Robots 3 List the applications of different types of Robots	5.1 Introduction Types of Robots and their working principle 5.2 Physical Configuration ,Basic robot motions 5.3 Technical features such as – Work volume, precision and speed of movement, Weight carrying capacity, robot sensors 5.4 Applications-Material transfer, Machine loading, Welding, Spray coating, Assembly	08
6 Flexible Manufacturing system	1 Define FMS,CIM and Lean manufacturing 2 Describe various parts of the FMS 3 List the applications of FMS 4. Justify the use of CIM and Lean Manufacturing.	6.1 Introduction Scope and Benefits of Flexible Manufacturing system. 6.2Types and major elements of Flexible manufacturing system 6.3 Equipment used in FMS, Application of FMS. 6.4 Introduction to CIM and Lean Manufacturing	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw a two dimensional object by using Pro-E or Higher version CAD software.	1 Introduction to CAD/CAM	08
2	Prepare 3D model of an object by using Pro-E or Higher version CAD software.	2.Geometric Modeling Surfaces and Solids	08
3	Identify the various parts and sytems of CNC machine	3Introduction to CNC	04
4	Develop the part programme for turning operation by using G and M code.	4.Part Programming	04
5	Prepare a visit report on industry having Automation in manufacturing.	6 Flexible Manufacturing System	04
6	Prepare a visit report on industry having robots to perform various operations.	5. Industrial Robotics	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to CAD/CAM	04(04)	10(04)	00(00)	14(08)
02	Geometric Modelling : Surfaces and Solids	04(02)	04(04)	04(00)	12(06)
03	Introduction To Computer numerical control	02(02)	04(04)	06(00)	12(06)
04	Part Programming	02(00)	04(04)	06(06)	12(10)
05	Industrial Robotics	02(00)	06(04)	00(00)	08(04)
06	Flexible Manufacturing system	04(00)	04(00)	04(06)	12(06)
		18(08)	32(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	3	R	2	4	R	2	5	R	2	6	R	2	6	R	2	2	R	2	5/7
	3	R	2																
02	1	R	4	2	U	4	2	R	4	1	R	4	1	U	4				3/5
03	4	U	4	3	U	4	1	U	4	3	U	4	4	U	4				3/5
04	2	U	4	6	U	4	6	A	4	5	U	4	2	U	4				3/5
05	3	A	6	4	A	6	4	A	6										2/3
06	5	U	6	1	U	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESMENT 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	Prepare 2D and 3D model	20
2	Develop Program	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	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	3	3
5	-	3	3	3	-	-	-	-	-	3	3	3
6	-	3	3	3	-	-	-	-	-	3	-	3

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Edition and year of Publication	Publisher, ISBN Number
1.	CAD/CAM Principles and Applications	P.N. RAO ,Tata McGraw - Hill	9780070583733
2.	CAD/CAM/CIM	Radhakrishna P &Subramanyam, Wiley Eastern Ltd	0-85312-274-1.
3.	CNC Machine	B .S. Pabla and M. Adithan, New Age International ltd	8122406696
4.	Computer Aided design and manufacturing	Groover M. P &ZimmersJr, Prentice hall of India	9780132441889

❖ **E-REFERENCES:**

- <http://nptel.ac.in/> accessed on 9th August, 2016
- www.learnerstv.com accessed on 9th August, 2016
- <http://auto.howstuffworks.com/> accessed on 9th August, 2016
- nptel.iitk.ac.in/ accessed on 9th August, 2016

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

- Wrenches, Ratchets, and sockets
- Pliers, screwdrivers,
- Hammers, and pry
- Calipers, micrometers
- Jack Stands Bottle/Scissor Jacks.

❖ **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.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.S.D.Thakre	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.A. Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr. L.P.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AUTOMOBILE ENGG.

LEVEL NAME : ELECTIVE COURSES

COURSE CODE : AE504E

COURSE TITLE : AUTOMOBILE AIR CONDITIONING SYSTEM

PREREQUISITE : NIL

TEACHING SCHEME: TH: 03; TU: 00; PR: 02(CLOCK HRs.)

TOTAL CREDITS : 04 (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:**

Current vehicular market is comfort oriented, as a part of this; Modern cars, Multi-utility vehicles, heavy passenger and goods vehicles are equipped with "heating ventilation and air conditioning (HVAC) system". Air conditioning installation, servicing, therefore offers good job opportunities for diploma engineers. This subject will make student to understand and apply the knowledge in servicing various systems and subsystems of Air Conditioning and related systems and subsystems.

COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify various HVAC systems and sub systems.
2. Select the suitable Air Conditioning Systems and sub systems.
3. Analyze the requirements and capacity of the heating ventilation and air conditioning system of the vehicle.
4. Dismantle and assemble the HVAC system
5. Perform leakage test of A.C.
6. Evacuate and charge refrigerant of A.C.system.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Introduction to HVAC	1. Define air conditioning and related parameters. 2. Describe the various factors which affect the human comfort. 3. Describe requirements of HVAC for LMV, Heavy goods vehicle, Heavy passenger vehicle 4. Describe construction Working and application of the controlled, Uncontrolled Ventilation and its Working 5. Compare Controlled and Controlled ventilation on the basis of various factors. 6. Justify Air conditioning system plays important role in the human comfort.	1.1 Introduction • Environmental and safety aspects in heating, Ventilation and air conditioning systems. • Human comfort control - comfort zone, air movement, wind chill factor, odour problems and effects of humidity. • Heat transfer fundamentals- convection, radiation, evaporation and conduction. 1.2 Requirements of heating, ventilation and air conditioning system for light motor vehicle, Heavy goods vehicle Heavy passenger vehicle 1.3 Controlled and uncontrolled ventilation - working, application and Comparison.	10
2. Case and Duct System	1. List various case and duct systems. 2. Draw block diagrams of rear heating and cooling system 3. Describe Construction and working of various case and duct systems.	2.1 Construction and working of Air intake section, core section and distribution section. 2.2 Construction and working of Downstream, upstream, split and hybrid system. 2.3 Construction and working of rear heating and cooling system	06
3. Air Conditioning System	1. List the functions of various components of Air Conditioning System 2. Draw layout of the Automobile Air Conditioning System. 3. Describe construction and working of Automobile air conditioning sub systems. 4. State the use of various elements of Air Conditioning System 5. Describe various color code	3.1 Layout and Sub system • General layout of Automotive Air conditioning system. • Construction and working of following refrigeration sub systems • Thermostatic expansion valve, fixed orifice tube and rotary vane aircycle system. • Construction and working of evaporator, condenser, accumulator.	08

	and purity tests 6. Justify effect of air conditioning on operating cost. 7. List the properties of various refrigerants. 8. Compare various metering devices. 9. Describe the construction and working of various metering devices.	- Receiver, driers and accumulator 3.3 Construction and working of reciprocating, scroll and rotary vane Compressors. Drive systems for compressors. 3.4 Refrigerant- - Properties - Types - Packaging and storage - color code and purity test 3.5 Metering devices- - Comparison of thermostatic Expansion valve and fixed orifice tube. - Types, working and comparison of thermostatic Expansion valves i.e. H valve, block type, internally equalized and externally equalized. 3.6 Functions of thermostatic expansion valve i.e. Throttling action, modulating action and controlling action. Construction and working of remote bulb.	
4. Comfort Heating System	1. Define Comfort 2. State the functions of various components of Comfort Heating System 3. Describe Construction and working of Comfort Heating System. 4. Describe general fault and their remedies of comfort heating system.	4.1 Functions of Comfort Heating System 4.2 Construction and working of Comfort Heating System 4.3 Maintenance 4.4 General faults and their remedies	
5. System Control Devices	1. List the various sensors used in the HVAC 2. Describe construction and working of various switches and sensors 3. Describe the construction and working of switches and sensors. 4. Draw and Describe Block diagram of climate control system and Electronic climate control system.	5.1 System controls - Construction and working of Typical vacuum system and electronic temperature control system 5.2 Construction and working of vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve and check relays. 5.3 Switches - Construction and working of high- Side temperature switch, low-side	04

	5. Justify the changes for conversion of conventional climate control system into Electronic climate control system.	temperature switch, high pressure switch, low- pressure switch, pressure regulator, ambient switch and superheat switch. 5.4 Sensors- Construction and working of sun load sensor, outside temperature sensor and in car temperature sensors. 5.5 Controls- • Concept of Aspirator, blower clutch control, heater control, and time delay relay for heater control. • Block diagram of climate control system and Electronic climate control system.	
6. Repairs and Maintenance of Air Conditioning System	1. Describe Procedure for Moisture removal, charging and discharging, routine maintenance of A.C. 2. Describe Constructional details of system hoses, charging hose with shut off valve and connectors. 3. Justify regular maintenance increases the life of component. 4. Prepare maintenance schedule.	6.1 Maintenance of A.C. Systems- Visual and acoustic check, side glass, leak test, Temperature test, procedure of charging and discharging, Moisture removal procedure. • Service equipments and tools- Vacuum pump, Manifold and gauge i.e. Low side and high side, gauge calibration recovery unit and recycling unit, Halide (Freon) and Fluorescent leak detector, nitrogen leak tester 6.2 Symptoms, Faults , causes and remedies • Compressor 6.3 Hoses and connectors - construction of system hoses, charging hose with shut off valve and connectors.	08
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the parts , systems and subsystems of automobile Air Conditioning System • Observe the system • Draw layout of Automobile Air Conditioning System and sub systems. • List the Functions of the parts. • Draw the layout of the system.	Air Conditioning System	04
2	Use tools, gauges and equipment for servicing of A.C. system. • Identify the special tools • Dismantle the HVAC • Calibrate and use the tools	Air Conditioning System	04
3	Evacuate and charge refrigerant of A.C.system. • Identify need of the evacuation and charging of refrigerant • Carry out evacuation and charging of refrigerant as per standard procedure	Air Conditioning System	04
4	Perform Leakage test of A.C. system. • Identify the need of the leakage test • Carry out leakage test • Follow standard Procedure for the leakage test.	Repairs and Maintenance of Air Conditioning System	04
5	Sketch all types of Duct system by observation.	Case and Duct System	04
6	Prepare a report on Diagnosis of control systems	System Control Devices	04
7	Prepare a visit report on visit to the modern garage for servicing of HVAC system. Report includes- • Service schedule • General maintenance of the HVAC system • Procedure to Solve the minor stoppage • Advancements in the HVAC system	Introduction to HVAC	04
8	Diagnose various running faults in car HVAC and write their causes	Repairs and Maintenance of Air Conditioning System	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to HVAC	04(02)	08(08)	08(00)	20(10)
02	Case and Duct System	00(02)	04(00)	00(00)	04(02)
03	Air Conditioning System	02(00)	04(00)	06(06)	12(06)
04	Comfort Heating System	02(00)	06(04)	00(00)	08(04)
05	System Control Devices	06(04)	04(08)	06(00)	16(12)
06	Repairs and Maintenance of Air Conditioning System	02(00)	08(00)	00(06)	10(06)
	Total	16(08)	34(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	A	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	5/7
	2	R	2																
02	1	R	4	1	U	4	6	U	4	1	U	4	5	U	4				3/5
03	5	R	4	4	U	4	3	U	4	2	U	4	1	U	4				3/5
04	5	U	4	6	U	4	1	U	4	5	U	4	4	R	4				3/5
05	2	U	6	1	A	6	3	A	6										2/3
06	3	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	Identification and selection of tools and equipments	20
2	Performance	20
5	Viva vice	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	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.	Automobile Air Conditioning	Boyce H. Dwiggins, S.Chand (G/L) & Company Ltd; 8th Revised edition, 2001	1978-0766807884
	Automotive Heating and Air Conditioning	Halderman/Birch, Automotive Series) 4th Edition, 2012	978-0131184916
2.	Automotive Mechanics	William L.Crouse/ Donald Anglin Tata Mcgraw Hill Publications, 2012	9780070634350
3.	A text book of Refrigeration and Air Conditioning	R. S. Khurmi and J. K. Gupta S. Chand, 2014	978-8121927819
4.	Refrigeration and Air Conditioning	P. N. Ananthanarayanan, Tata McGraw Hill	9781259062704
5.	Principles of Refrigeration	Roy Dossat, Pearson Education, 2012	9788177588811
6.	Refrigeration and Air Conditioning	Domkunwar and Arora, DhanpatRai and Sons, 2012	9788177001075
7	Automobile engineering vol-vi : Air Conditioning	Anil Chkiara, Satya Publication, 2012	81-7684-078-5

❖ **E-REFERENCES:**

- ❖ <http://nptel.ac.in/courses/112105128/1> accessed on 6th Sept.2016
- ❖ <http://freevideolectures.com/Course/2372/Refrigeration-and-Air-Conditioning> accessed on 6th Sept.2016
- ❖ <http://www.vulkan.com/en-us/lokring/videos> accessed on 6th Sept.2016
- ❖ <http://nptel.ac.in/video.php?subjectId=112105128> accessed on 6th Sept.2016

❖ **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.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr. S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr. Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr. L.P. Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	AnjumanCollege of Engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Rasoni Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: ELCTIVE COURSES
COURSE CODE	: AE505E
COURSE TITLE	: EARTH MOVING MACHINE
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (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:

Earth moving machinery plays important role in the infrastructural development activities in growing India. India is one of the largest suppliers of the earth moving machineries in the world. So it is essential for engineers to have the knowledge of these machineries, as its market, maintenance and related services. This subject will develop the ability in the student to apply the knowledge about systems and subsystems and features, and some advanced technologies as performance and efficiency concern.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select the proper machinery for the specific application and for specific site
2. Identify the various systems & subsystems of earth moving machines & agricultural machines
3. Justify the purpose of maintenance.
4. Prepare maintenance schedule of earth moving machinery.
5. Diagnose the faults and perform minor settings and adjustments.
6. Perform various operations by using farm equipment.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Earth Moving Machines – Introduction	1. Define the terms related to earth moving machineries 2. State the applications of the different types of earth moving machinery 3. Draw a layout of various earth moving machineries. 4. Compare various types of earth moving machineries on the basis of various parameters. 5. Describe the role of earth moving machineries in the development of the rural India. 6. Describe the procedure for the RTO registration of the earth moving machineries,	1.1 General layout, Application & Classification of earth moving machines. Comparison of tyred & crawler tractor 1.2 General Specifications of a typical earth moving machine. 1.3 Comparison between general automobile & earth moving machine on following parameters: • Traveling Speed • Working conditions • Power output & power variations • Controls • Torque & torque variations. • Steering • Suspension • Fuel & fuel consumption • Hydraulics • Power take offs • Clutch • Brakes • Driving license • RTO registration 1.4 Implications of earth moving machines on economy & infrastructure development: Next five year plan, Role of earth moving machine in road laying, bridge construction, building construction, tunnel, mining & in disaster management.	10
2. Tractor Dozer	1. List the different applications of the tractor dozer and ripper 2. State various safety precaution for dozer operations 3. Describe types of ripper and dozer blades. 4. Describe construction and working of the track shoe. 5. Compare hinge and parallelogram ripper and dozer blade 6. Select rippers and blades for various applications 7. Justify, purpose of maintenance for improving life of equipments.	2.1 Tractor dozer- types, layout, power train & bucket swing Applications i.e. ripping, blasting Vs ripping) 2.2 Rippers – types i.e. hinge & parallelogram, their application & comparison. • Ripper tip selection. • Dozing, & Underwater application. 2.3 Dozer blade – types i.e. straight dozer, angle dozer, S' blade, 'U' blade, 'C' blade, 'A' blade, and their applications. 2.4 Track shoe construction & working. 2.5 Under carriage maintenance. 2.6 Safety precautions for Dozer operations.	06

3. Loaders & Excavators	1. List various attachments of the crawler loader, hydraulic excavator 2. State various applications of the ladders and excavators 3. Draw neat sketch of the crawler tractor, scraper etc. 4. Describe constructional details of the crawler tractor, Wheeled tractor, scraper 5. Describe various systems and subsystems of the crawler tractor, Wheeled tractor, scraper 6. Describe special features provided arrangements in loaders and excavators to maintain the traction and stability during the operations. 7. Describe various features provided in earth moving machineries for operators comfort.	3.1 Crawler loader – working & attachments i.e. standard bucket, bulk handling bucket, fork lift attachment, crane attachment Stability & safety of crawler loader operations. 3.2 Wheeled loader – types i.e. back hoe & front hoe, working, capacity & output. 3.3 Hydraulic Excavator: Application, block diagram, types of buckets & their applications e.g. 3 in 1 bucket, ejector bucket, square hole bucket, ditch digging bucket, clay bucket and hydraulic grab. 3.4 Scraper: Block diagram, types – Towed & self	
4. Dragline (Rope Operated Excavator).	1. List the applications of the dragline, clamshell, cranes 2. Draw the layout of the dragline and various cranes 2. Describe construction and working of the hoe and cranes, clamshell	4.1 Applications of dragline i.e. excavating channels, ditches, trenches, underwater soil, stripping overburden, shallow grading, general excavation, loading into hoppers 4.2 loading hauling units, sloping & grading. (simple sketches only) 4.3 Clamshell - application, capacity, bucket, construction & size 4.4 Hoe and Cranes - their working & Application.	08
5. Tractor	1. List the various attachments of tractor and power tiller 2. List the applications of tractor and power tiller 2. Draw the general layout of the tractor and power tiller. 3. Describe construction and working of power take off shaft 4. Describe various parameters affecting on	5.1 Comparison of tractor with an automobile 5.2 Indian tractor industry 5.3 General Layout of a tractor 5.4 Power train & transmission layout of a tractor 5.5 Tractor Power take off its working & construction 5.6 Tractor tyres construction & selection 5.7 Counterweight & its importance 5.8 Types of implements in tractors, its uses & its effect on performance of	08

	selection of tyres 5. Describe service schedule of the tractor and power tiller. 6. Describe how counterweight plays an important role in stability of the tractor. 7. Compare tractor with an automobile and power tiller 8. Describe various features of the tractor tyres .	a tractor 5.9 Power tiller- Comparison with tractors, Various attachments & its applications 5.10 routine service schedule of the tractor	
6. Forklift Truck , tipper & road roller	1. List the applications of the forklift trucks, tipper , road roller 2. List the various types of road rollers, 3. Draw the general layout of the fork lift truck tipper and road roller. 4. Describe steering mechanism of the forklift trucks. 5. Describe construction and working of the tipper mechanism, lifting mechanism in forklift trucks. 6. Describe construction and working of forklift, tipper , road roller 7. Describe various Considerations to select the Forklift Truck , tipper & road roller	6.1 Forklift Truck- Types, layout, lifting mechanism, counterweight & steering mechanism. Safety in operation. 6.2 Tipper – Types, construction & working tipping mechanism & maintenance. Safety in operation of tipper. 6.3 Road roller- Types, layout, operation & maintenance. 6.4 Considerations to select the Forklift Truck , tipper & road roller	10
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various systems and components used in any one earth moving machinery.	All Units	04
2	Prepare a maintenance schedule of any one earth moving machinery.		06
3	Remove and Attach various special tools and equipments to any one earth moving machinery.		06
4	Identify and diagnose fault of any one earth moving machinery.		04
5	Perform various operations by using Tractors.	Tractors	06
6	Prepare a report on advanced technologies in earth moving machineries Report includes- Recent technologies in the area of - Emission control fuel efficiency - Reliability and durability of the equipment - Stability of the equipment - Comfort of the operator - Capacity enhancements - Overall dimensions(Compactness) - Materials - Use and implementation of the above in existing systems	All units	06
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Earth Moving Machines – Introduction	00(02)	04(00)	00(00)	04(02)
02	Tractor Dozer	04(02)	08(08)	08(00)	20(10)
03	Loaders & Excavators	02(00)	04(00)	06(06)	12(06)
04	Dragline (Rope Operated Excavator).	02(00)	06(04)	00(00)	08(04)
05	Tractor	06(04)	04(08)	06(00)	16(12)
06	Forklift Truck , tipper & road roller	02(00)	08(00)	00(06)	10(06)
	Total	16(08)	34(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	2	A	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

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	Identification of the various parts and systems	10
2	Performance	20
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	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	3	3
6	-	3	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.	Art of Earthmoving	Jagman singh, South Asia Books, Edition 3.	978-8120401211
2.	Tractors and their Power Units	John B. Liljedahl, Paul K. Turnquist, David W. Smith, Makoto Hoki, Springer US, 1 st edition, 1989	978-1-4684-6634-8
3.	Allis-Chalmers Construction Machinery and Industrial Equipment Crestline series	Norm Swinford, MBI Publishing Company, 1 st Edition, 1998	0760304858, 9780760304853
4.	Caterpillar: Modern Earthmoving Marvels	Frank Raczon, Keith Haddock, Motor books, 2015	0760344086, 9780760344088

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=XLa1ubxJH0I> , accessed on 09th September 2016
- https://www.youtube.com/watch?v=_7IR_CLhIek , accessed on 09th September 2016
- <https://www.youtube.com/watch?v=UYZYPIWBI84> , accessed on 09th September 2016

❖ **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.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr. M.D.Jadhao	Head of Department Automobile Engineering	GH Raisonni Polytechnic Nagpur
10	Mr. P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AUTOMOBILE ENGG.
LEVEL NAME	: PROFESSIONAL COURSES
COURSE CODE	: AE506E
COURSE TITLE	: ALTERNATIVE FUELS
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1CLOCK HR.,1PR CREDIT = 2CLOCKHR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

World's energy consumption steadily increases due to enhancement of quality of life, increase in transportation etc. Most of the energy demand can be fulfilled with the help of fossil fuels. Reservoirs of these fuels are limited. The aim of inclusion of this subject in the curriculum is to develop the ability in the student to develop the alternative energy sources so as to reduce the dependability on the non renewable power sources and improvements in engine performance and emission concern and their material compatibility concern.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply recent technologies of alternative fuels in vehicle.
2. Select suitable alternative fuels for vehicle.
3. Analyze effect of blending of bio-fuels on performance and emission characteristics of the engine
4. Conduct the test to find out effect of blending of various biofuels on the performance and emission characteristics of the S.I and C.I. engine
5. Test various properties of fuel blends.
6. Fitment of LPG and CNG kit on a vehicle

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Biofuels: Alcohol	1. Define various properties of the alcohol. 2. Describe emulsification process of alcohol and diesel. 3. List the various properties of the alcohols 4. Describe effect of alcohol blending with gasoline on engine performance and emission characteristics. 5. Describe various modifications required	1.1 Sources of Methanol and Ethanol, methods of its production. 1.2 Properties of methanol & ethanol as engine fuels, 1.3 Use of alcohols in S.I. and C.I. engines, 1.4 performance of blending methanol with gasoline. 1.5 Emulsification of alcohol and diesel. 1.6 Dual fuel systems. Improvement/Change in emission characteristics with respect to % blending of Alcohol. 1.7 Recent advances in vehicles running on alcohols	06
2 Biofuels: Bio-diesels	1. Define various properties of the biodiesel 2. Describe process of separation of the biodiesel 3. List the various properties of the biodiesel. 4. Describe effect of biodiesel blending with pure diesel on engine performance and emission characteristics. 5. Describe various modifications Required in existing system.	2.1 Base materials used for production of Bio Diesel - Karanji oil, Neem oil, Sunflower oil, Soyabean oil, Mustard oil, Palm oil, Jatropha seeds, and Algae. 2.2 Process of separation of Bio Diesel. 2.3 Properties Diesel blended with vegetable oil, and difference in performance of Engine. 2.4 Vegetable Oils: Various Vegetable oils for Engines 2.5 Esterification process 2.6 Performance and emission characteristics of various blends of biodiesel. 2.5 Recent advances in vehicles running on alcohols	12
3. Biofuels: Biogas	1. List the advantages and disadvantages of the biogas as a fuel for fuels. 2. State the various factors affecting on biogas formation. 3. Describe important properties of	3.1 Introduction to Biogas system 3.2 Process during gas formation, 3.3 Factors affecting biogas formation. 3.4 Effect of Biogas on vehicle performance.	12

	the biogas. 4. Describe effect of biogas on performance and emission of the engine.	3.5 Modifications required in existing system 3.6 Recent advances in vehicles running on biogas. 3.7 Limitations of the Biogas for use in the vehicle. 3.8 Comparison of biogas and syngas on the basis of various parameters.	
4. LPG	1. List the advantages and disadvantages of the of LPG 2. Describe effect of various properties of the LPG 3. Describe effect of LPG on engine performance and emission characteristics.	4.1 Properties of LPG as engine fuels, 4.2 Combustion and emission Characteristics of the LPG 4.3 Effect on engine performance, 4.4 Storage, cost and safety of LPG 4.5 Recent advances in vehicles running on LPG	06
5. CNG	4. List the advantages and disadvantages of the of CNG as a fuel for automobile 5. Describe effect of various properties of the CNG on engine performance. 6. Describe effect of CNG on engine performance and emission characteristics.	5.1 Properties of CNG as engine fuels, 5.2 Combustion and emission Characteristics of the CNG 5.3 Effect on engine performance, 5.4 Storage, cost and safety of CNG. 5.5 Recent advances in vehicles running on CNG. 5.6 Comparison of LPG, CNG and biogas on the basis of various parameters and properties.	06
6. Hydrogen	1. List the various components used in the electrical and hybrid vehicles 2. Draw a layout of Electrical and hybrid vehicles 3. Describe working principle of electrical and hybrid vehicle 4. Describe advantages and disadvantages of electrical and hybrid vehicles	6.1 Production methods of hydrogen. 6.2 Properties of hydrogen. 6.3 Challenges associated with hydrogen as fuel and its solutions. 6.4 Different methods of using hydrogen in SI and CI engines. 6.5 Performance, emission and combustion analysis of hydrogen as a fuel. 6.6 Safety aspects of hydrogen storage.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a report on engine modification required to use the alternative fuels for petrol and diesel engine.	Biofuels: Alcohol, Biofuels: biodiesel	04
2	Conduct test for performance and emission test on bifuel vehicles • Take Original performance of the engine • Carryout minor modifications in the engine • Take performance of the engine with bifuels • Compare results with original performance • Analyze the results		04
3	Test various properties of the various blends of the fuels.		04
4	Conduct test to find out effect of blending of ethanol on performance and emission on S.I. Engine (Test on Two Wheeler vehicle) • Take Original performance of the engine • Carryout minor modifications in the engine • Take performance of the engine with ethanol • Compare results with original performance • Analyze the results	Biofuels: Alcohol	04
5	Conduct test to find out effect of blending of edible oil on performance and emission on C.I. Engine (trial on four wheeler diesel vehicle) • Take Original performance of the engine • Carryout minor modifications in the engine • Take performance of the engine with edible oil • Compare results with original performance • Analyze the results	Biofuels: biodiesels	04
6	Fitment of LPG kit on a vehicle	LPG	04
7	Fitment of CNG kit on a Vehicle	CNG	04
8	Prepare a report on material compatibility of various alternative fuels	Biofuels: Alcohol, Biofuels: biodiesel	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Biofuels: Alcohol,	00(02)	04(00)	00(00)	04(02)
02	Biofuels: biodiesel	06(04)	08(04)	06(04)	20(12)
03	Biofuels: biogas	06(04)	04(04)	06(00)	16(08)
04	LPG	02(00)	08(00)	00(06)	10(06)
05	CNG	00(02)	04(04)	06(00)	10(06)
06	Hydrogen	04(00)	06(06)	00(00)	10(06)
	Total	18(12)	34(18)	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	2	R	2	3	R	2	4	R	2	6	R	2	6	R	2	1	R	2	5/7
	5	R	2																
02	1	U	4	2	R	4	2	U	4	2	R	4	2	U	4				3/5
03	3	R	4	3	U	4	2	U	4	3	U	4	3	R	4				3/5
04	4	U	4	4	U	4	5	U	4	5	U	4	2	A	4				3/5
05	2	A	6	3	A	6	4	A	6										2/3
06	5	A	6	6	U	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
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			

❖ PRACTICAL EVALUATION

S.N.	Description	Max. Marks
1	Preperation of setup	10
2	Performance	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	3	3	3	3	3	3	3	3	3
2	-	3	3	3	3	3	3	-	-	-	3	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
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.	Alternative Fuels Guidebook Properties, Storage, Dispensing, and Vehicle Facility Modifications	Richard L. Bechtold, RE, Society of Automotive Engineers, Inc. Warrendale, 1 st Edition, 2000	0-7680-0052-1
2.	Biofuels and Bioenergy Processes and Technologies	Sunggyu Lee and Y. T. Shah, CRC Press Taylor & Francis Group ,1 st Edition, 2013	13: 978-1-4200-8956-1
3.	Electric and Plug-In Hybrid Vehicles Advanced Simulation Methodologies	Bogdan Ovidiu Varga, Florin Mariasiu, Dan Moldovanu, Calin Iclodean, Springer-Verlag London Limited, 2015	978-3-319-18639-9
4.	Alternative fuels and advanced vehicle technologies for improved Environmental performance Towards zero carbon transportation	Richard Folkson, Woodhead Publishing (Elsevier), 2 nd Edition, 2013	978-0-85709-742-2
5.	Alternative Fuels	Arumugam S. Ramadhas, CRC	13: 978-1-4398-

	for Transportation	Press Taylor & Francis Group, 2013	1958-6
6.	Alternative Transportation Fuels Utilisation in Combustion Engine	YorkM. K. Gajendra BabuK. A. Subramanian, CRC Press Taylor & Francis Group, 1 st Edition, 2013	13: 978-1-4398-7282-6
7	Biodiesel A Realistic Fuel Alternative for Diesel Engines	Ayhan Demirbas, Springer-Verlag London Limited, 2008	13: 9781846289941
8	Handbook of Alternative Fuel Technologies	Sunggyu LeeJames G. Speight Sudarshan K. Loyalka, CRC Press Taylor & Francis Group 2013	13: 978-0-8247-4069-6

❖ **E-REFERENCES:**

<https://www.youtube.com/watch?v=sHDYR2f5BMI> accessed on 12th Sept., 2016

<https://www.youtube.com/watch?v=se0Qs3fZL5Y> accessed on 12th Sept. 2016

<https://www.youtube.com/watch?v=uACOW2KJd6w> accessed on 12th Sept. 2016

❖ **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.V.S. Kumbhar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3.	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4.	Mr.S.D. Thakare	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5.	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr. A.A.Ozarkar	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
7	Mr K.L.Kirpane	Manager Training Section	Mahindra institute of learning Excellence Nagpur
8	Mr P.N.Wadaskar	Assistant Professor	Anjuman college of engineering Nagpur
9	Mr M.D.Jadhao	Head of Department Automobile Engineering	GH Raison Polytechnic Nagpur
10	Mr.P.C.Nichat	Head Training Section	Ashok Leyland Training Centre Nagpur
11	Mr. Abhas Disawal	Entrepreneur	Kalimbi Venture 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.

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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 Jan 2016

❖ **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.

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GOVERNMENT POLYTECHNIC, NAGPUR.

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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.

 (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/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.

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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**

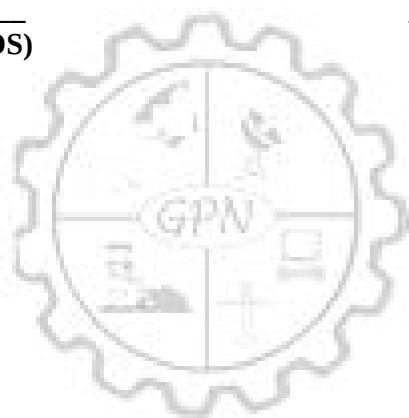
- ❖ As per requirement of related field.

❖ **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 Automobile Engineering Program

Lead in Imparting Education in Automobile Engineering.

Mission of the Automobile Engineering Program

- M1:** To develop industry ready students also maintain the scope for vertical mobility.
- M2:** To inculcate innovative and problem solving approach towards the work.
- M3:** To develop globally acceptable students who can implement modern technology.
- M4:** To develop lifelong learning ability with ethical, societal and environmental protection.

Program Educational Objectives - PEOs

- PEO 1:** To develop diploma pass out students with sound mathematical, scientific and engineering fundamentals.
- PEO 2:** To develop an ability in the students to identify, formulate and solve engineering problems based on design, developments and its result analysis.
- PEO 3:** To equip students with modern engineering tools, skills and practices to get ready made input to the industry.
- PEO 4:** To develop an ability in student to work in teams in different projects across the globe with effective engineering as well as interpersonal communication.
- PEO 5:** To provide students with learning environment awareness to the lifelong learning needed to professional growth with ethical responsibilities.

Program Specific Outcomes - PSOs

- PSO1 :** Maintain the vehicles.
- PSO2 :** Apply knowledge of manufacturing process drawing, design and automobile technology for automobile manufacturing industry.

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.



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