GOVERNMENT POLYTECHNIC, AURANGABD

(An Autonomous Institute of Govt. Of Maharashtra)

Curriculum for

DIPLOMA IN

AUTOMOBILE ENGINEERING

[6TH Revision]

Department of Automobile Engineering,

Government Polytechnic Aurangabad

(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

May, 2017

PREFACE

Government Polytechnic, Aurangabad is one of the oldest institute in Maharashtra was established in the year 1955-56. Over the period of time the institute, through its untiring efforts has created its own niche and has been functioning as a Lead Technical Institute in the State of Maharashtra to serve the Industry and Society by producing excellent technical manpower.

Government Polytechnic, Aurangabad has expanded quantitatively from an intake of 180 in 1995 with three programmes to 720 Intake in eight programmes. The Institute has been striving relentlessly for achievement of excellence in technical education. Government Polytechnic, Aurangabad has been functioning with 'the Autonomous Institute status', since 1994.It is presently functioning in three shifts, by running Diploma Programmes in I Shift (Regular), II shift and Part Time Diploma programmes in evening shift. I am proud to share that, the Institute has been ably rewarded with three state level awards for its best performance in the state of Maharashtra.

Institute has revised the curricula five times in the past and the sixth revision which was due, was initiated in the year 2015 and finally , the revised(sixth) curricula which is the outcome of, search conference under the guidance of NITTTR, Bhopal ,several workshops and deliberations, has been implemented with effect from 2017-18 with the approval of Programme wise Board of Studies (PBOS) Board of Studies (BOS) and consent of Governing Body .

The hallmark of sixth revision is, adopting 'Outcome Based Education Philosophy' as the basis for Curriculum Design and Development process. The 'Vision & Mission' of Institute and programme offering Departments, and with programme Educational Objectives (PEOs) ,Programme Outcomes as mandated by National Board of Accreditation (NBA) have been considered as points of reference for curriculum revision. Taking into account the need/ demand of industry and society, the courses such as Vocational Training (Industrial/ In-plant Training), Seminar and Development of Life Skills for all the programmes have been introduced as compulsory. To accommodate these additional courses and other requirements, the credits of each programme have been enhanced from 184 to 194.

‘Skill India’, ‘Digital India’ and ‘Make in India’ the flagship programmes/ initiatives of Government of India and State of Maharashtra have been the basic considerations in the curriculum revision process.

I deem this is as an opportune moment to recall the following proverb/quote which I view ashighlyrelevant, on the occasion of writing the preface.

"If you are planning for a year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people." *–* ***A Chinese proverb****&*

As the Indian Education Commission of 1964-66, also known as the *Kothari Commission*, it is stated that

“The destiny of our country is being shaped in our classrooms”.

I take great pride in appreciating the efforts of Faculty of all Departments. All faculty have taken determined efforts under the guidance of NITTTR Bhopal, Industry experts, academicians and Curriculum Development & Implementation Cell (CDIC) in the revision of curricula. I appreciate the contribution of alumni, students and faculty by making valuable suggestions / feedback for the revision of curricula.

I wish to assure, that the curriculum of all programmes will be implemented in true spirit to achieve the intended educational objectives of the programme.

(Prof.F.A.Khan)
Principal
Government Polytechnic,
Aurangabad

Government Polytechnic Aurangabad

(An Autonomous Institute of Government of Maharashtra)

Vision

"To be the internationally accredited institute that contributes in the development of competent professionals & entrepreneurs on the platform of technology based systems blended learning through highly qualified and trained staff".

Mission

"To educate and train globally competent individuals, professionals, technicians and skilled human resources through world class curriculum, student centric academic system, team of committed, trained faculty and staff contributing to the student's successful employment and entrepreneurship with a spirit of patriotism and concern for the environment."

Diploma in Automobile Engineering

VISION

"By 2026 the department of Automobile Engineering will be the centre of excellence through development of competent Professionals and entrepreneurs on high tech automobile engineering platform in collaboration with industry and organization."

MISSION

"We pursue relevant education to educate and trained individuals, professionals, technicians and skilled workforce for wage and self employment through world class curriculum, student centric academics systems and passionate faculty and staff members."

Curriculum 06

1. Introduction

Curriculum 06 represents the outcome of 6th revision of curricula of various programmes being offered by Government Polytechnic, Aurangabad (GPA). After conferring academic autonomy to 10 Government Polytechnics during Second Technician World Bank Assisted Project (Tech Ed II) implemented from 1992 to 1999 the curriculum revision process is being carried out after every 4-5 years and after completing 2-3 cycles of every programme in them. Our Institute, being Academically Autonomous since 1994, has been following the same practice and after designing curricula of the programmes for the first time in 1994 under autonomous status, undertook revision exercises chronologically in year 1999 (2), 2004 (3), 2009 (4) and 2011 (5). Hence this curriculum is Curriculum 06.

Curriculum, as per Colombo Plan Staff College Manila (1984), means 'an educational programme designed, developed and implemented to attain predetermined educational objectives.' As per this definition any programme curriculum should be designed at the first instant for achieving purpose, objectives, outcomes that are decided well in advance, followed there by it is essential to develop requisite resources viz. Physical, Human, Information, time, energy, and finance taking into account design and finally it should be implemented using inputs of curriculum design and development in the same spirit. Further it is said by Hilda Taba (1962) – 'One who implements curriculum and programme in particular should design it.' More over curriculum at any level, let it be at unit, at course, at course category or at programme level at the top, comprises of (Ralph Tylor 1949)[1] rationale, objectives/ outcomes, content, Learning -Teaching strategies (LTS) and finally student's assessment and evaluation.

Curriculum design process has been evolving over last more than 55 years from the instant when for the first time Ralph Tylor, US Academician and curriculum theorist, expressed a need of designing a curriculum for any formal educational programme. If we go through a literature related to curriculum we witness different types of curriculum approaches like skill based, competency based, discipline based, integrated, interdisciplinary curriculum and it is the view of knowledge, the process of learning and the role of teachers and students, the learning goals and way they are expressed, the way content is chosen and organised, the purpose served by the assessment and strategies used for it and the last but not the least the kind of resources and infrastructure used (Toohey, S. 1999)[2] are the seven criteria using which we can identify/ choose an approach used in designing a given

[1]Tyler, R. W (1949) Basic Principles of Curriculum and Instruction. University of Chicago Press, Chicago.
[2]Toohey, S. (1999). Course Design in Higher Education, Society of Research into Higher education and Open University Press, London

programme curriculum. Broadly any curriculum is categorized into two types- discipline based and interdisciplinary curriculum and process and product curriculum.

We are in the era where technical manpower in general and engineering technicians in particular are required to solve relatively structured problems from nano – micro level to mega level (Jeff Lohmann 2009)[3]. It is expected from him/ her in that case to use knowledge of not only technology but also natural sciences (animate, inanimate and psycho-socio sciences) and mathematics. Moreover he/ she is required to use engineering, advance IT based tools and techniques in diagnosing faults and carry out maintenance. In solving problems at design, manufacturing, repairs and servicing/ maintenance these technicians are expected to demonstrate qualities towards minimizing effect of engineering solutions on society one side and to ensure environ friendly and sustainable solutions on the other. Furthermore, this technical manpower should have ability to work in team, communicate effectively, and remain updated of technologies they are expected to deal with. As per research on curriculum in engineering and technology education carried out in different parts of world it is concluded that philosophy, framework, approach and model that is to be used for developing technical manpower with such profile should be Interdisciplinary – Integrated curriculum (IIC).

Therefore, the philosophy of curriculum development used in designing curriculum 06 has been integrated – interdisciplinary in nature. It is connections, inter relation, inter dependence and inter connectedness among target knowledge and skills in general and that between courses at different levels in particular that should be formally established for students. It is the framework of various models viz. applied academics (AA), Across curricular approach (ACA), thematic curriculum (TC), multidisciplinary courses (MDC), Integrated examination (IE), nomenclature Coordination (NC) link courses (LC) viz. diad, triad or course cluster (CC), work based experiences (WBE) that is used in designing curriculum at course and programme levels

2. Outcome Based Criteria for programme accreditation

We are in the era of accords viz. Washington, Sidney, Dublin Accords in which gradation of any engineering and technology programme is carried out using outcome based criteria. All signatory countries are required to follow this practice not only as a provisional member but also after acquiring permanent membership of a selected accord. Over the years since 1931 criteria to accredited these programmes was 'Input Based' till 1998. It was the Outcome Based criteria that popularly known all over the world as EC2000, and which was devised for the first time by Accreditation Board for Engineering and Technology (ABET) USA, that is being followed for grading programmes for their quality since 1998. It is the

[3]Lohamann, J. (2009).

industry which made educational institutes to go for outcome based criteria where main emphasis is over outcomes – Not only what he/ she knows but also what he/ she is able to do.

Now after having acquired signatory status of Washington accord by our country National Board of Accreditation (NBA) has been using outcome based criteria in grading educational programmes of institutes awarding diploma and degree in engineering and technology. In that case NBA, which is empowered to undertake exercise of accrediting programmes, has developed indigenous criteria[4] for diploma programmes as follows: -

2.1. Vision, mission and programme educational objectives
2.2. Programme outcome
2.3. Programme curriculum
2.4. Students performance
2.5. Faculty
2.6. Facilities and technical support
2.7. Academic support unit and teaching learning process
2.8. Governance
2.9. Institutional support and finance resources
2.10. Continuous improvement

As All India Council for Technical Education (AICTE) has made it mandatory to institutions to follow curricular processes for extending Outcome Based Technical Education and get programme accredited from NBA based aforementioned criteria. For availing any support viz, new programme approval, continuation, grant, scheme an institute has apply for programme accreditation and get its programme accredited from NBA

3. Philosophy of Curriculum 06 at Govt Polytechnic Aurangabad

Curriculum 06 uses model, approach, philosophy evolved over the years in other part of the world and accepted by our nation through National Board of Accreditation (NBA), being signatory of Washington Accord. It is the curriculum development philosophy that will enable institutes to impart Outcome based education (OBE). It is essential in that case to design a programme curriculum, develop resources for implementing it, implement it and undertake student's assessment and evaluation to impart OBE.

Block diagram of Interdisciplinary - Integrated Curriculum (IIC) Development framework that is used in designing Curriculum 06 is given at Annexure 1. It has six stages as explained below

[4] NBA guidelines document (2014)

3.1. Identification of Diploma Graduate Profile- As per International Engineering Alliance (IEA) any engineering and technology graduate viz. Engineer, engineering technologist and engineering technician passes through three stages viz. International registration, professional registration and graduation stages during his/ her professional life cycle. For the engineering technician, however, there are only two stages of development - acquiring accredited qualification and getting professional registration after 3-5 years of graduation.

In order to identify attributes of a technician at both the level an input is sought from Policies of AICTE, NBA, and NITTTR, Vision and mission of the institute and the programme department, and needs of Industry & society formally and informally. At institute level a search conference was conducted under the guidance of senior faculty members of National Institute of Technical Teacher Training and Research, Bhopal

Programme Education Objectives (PEO), Programme Outcomes (POs) and Programme Specific Outcomes (PSO) of the given programmes are finalised after framing vision and mission of the institute followed by that of concerned programme department. Graduate attributes supplied by NBA are the used in framing 10 programme outcomes, the feedback from industry experts during search conference and in the form of questionnaire filled in are used to formulate Programme Educational Objective (PEOs) and programme specific outcomes (PSO).

3.1.1 Programme Educational Objectives (PEOs) – These are outcomes required to offer professional registration to diploma graduates. Duration search conference what presentations made and questionnaire filled in by representatives of specific industry are used to formulate PEOs for every programme. They are the statement which describe the abilities that diploma graduate will exhibit after three four years of his/ her graduation

3.1.2 Programme Outcomes – Programme outcomes being graduate exit abilities are written using graduate attributes supplied by NBA, refined using iterative process in department and finally validated in PBOS meeting. Diploma is expected to solve relatively structured programmes as per NBA and same is taken into account while framing them

3.1.3 Programme Specific Outcomes (PSOs)- POs are more generic in nature. The provision is made by NBA of framing 2-3 PSOs in addition to POs for which inputs given by industry through search conference and graduate profile survey having higher vetted mean are used.

3.2. Identification of Programme Structure- Programme structured is finalised at programme department using output of the preceding stage. It is the extensive exercise of identifying broad content required to meet identified PEOs, POs and PSOs, chunking it as per programme levels (guidelines of NBA, AICTE, & CDIC), further putting the content together to identify courses under a given level. Teaching and Assessment scheme for every course is decided based on the extent of content to be taught, referring the guidelines issued by CDIC. Models such as Nomenclature coordination, Thematic approach, multidisciplinary courses, course cluster, link courses etc successfully practiced in designing Interdisciplinary – integrated curriculum design are used in framing programme structure.

3.2.1. Nomenclature coordination- Use of same terminology in all courses or explaining similarities among different terminologies

3.2.2. Linked courses- Offering courses two or more courses viz. diad, triad, multidisciplinary as a course among which close linkage is vital.

3.2.3. Thematic approach- Use thematic (contextual) glue in framing unit title and identifying the content for that unit

3.3. Validation of programme structure – Programme structure is a vital input for further work of course curriculum development. It is should be as clear as possible and should follow policy given by CDIC. Hence, Programme Structure in final form is validated in PBOS meeting at department level for every programme.

3.4. Detailing of course curricula- Every Course curriculum is a basic building block of programme curriculum, the structure of which is supplied by CDIC to all programme curriculum coordinators. Moreover Department level workshops for writing elements/ parts of course curriculum viz. rationale, competency, course outcome, Major learning outcome, organising content in units, identification of laboratory experiments, writing specialised instructional strategies, preparing PO – CO articulation matrix etc were conducted by EDIC to enable course experts in writing course curriculum properly. Draft copy of each courses curriculum is validated by CDIC team in formal workshop mode at institute level

For certain general courses viz. Industrial organisation and management, Development of life skills, Environmental studies, Basic Computer Systems, Professional practices, Project, Seminar and Vocational Training the separate Course Curriculum Design Teams of subject experts from different departments are constituted at institute level. The team members collectively carried out the work that is validated at CDIC level.

Models such as Nomenclature coordination, Thematic, Across curricular & Applied Academic Approaches, multidisciplinary courses, Integrated examinations, works based experience (WBE), advance teaching models etc are used in framing course curricula.

3.5. Vetting of programme curriculum – Programme curriculum comprises of programme structure and course curricula of General and programme specific courses. It is the document of design process which remains valid for next 5 years. Moreover, this document is submitted to state board for getting equivalence certificate. It has many stakeholders viz. students, parents, academic professional bodies, industrial professional bodies and industry who refers it for different purposes. Hence this document is vetted in the formal meeting of PBOS, BOS and finally Governing Body of the institute.

3.6. Implementation and evaluation- Curriculum Implementation is a next stage of whole curriculum development process. Prior to implementation it is required to develop all sorts of resources and documents essential for proper implementation of curriculum.

Implementation involves annual planning, terms planning, course planning and finally planning of experiences to be imparted in classroom, lab, field and through experts. The plans are then executed to deliver instructions using requisite resources. Feedback during the implementation of courses curricula by various faculty members are used for formative and summative evaluation of curriculum.

3.7. Formative and summative evaluation- Programme curriculum is regularly reviewed by the course faculty members and their feed backs are used in reviewing course curriculum while some other feedbacks remain useful in revising of whole curriculum after 2-3 cycle

4. Curriculum 06 in particular

4.1. Introduction

Curriculum 06 comprises of 40 -45 courses at five levels viz. foundation courses, basic technology courses, allied courses, applied technology courses and diversified technology courses to be taught over three years of any diploma programme offered by GPA. It is the outcomes at five tiers viz. International & professional (after 3—5 years of graduation) registration, programme outcomes, course outcomes and major learning outcomes are used to establish not only intra course and inter courses integration but also the programme outcomes are getting linked to professional registration of diploma graduates.

4.2. Programme Levels - The levels of programme are derived as course clusters of similar courses. They are as follows: -

4.2.1. Foundation – This course level contains courses that remains foundation to learn not only basic technology but also technology courses of advance and diversified levels. Natural sciences and Mathematics (NS&M) are the subject areas from which these four courses are designed using Applied Academic Approach (AAA).

4.2.2. Basic Technology - This level represents set of courses that are derived from foundation courses. These courses link foundation courses with applied and diversified technology courses. For example, thermodynamics is a course derived from physics and mathematics and engineering materials has blend of chemistry and mathematics. In designing course curricula of the courses belongs to this level models like nomenclature coordination, thematic approach, etc are used

4.2.3. Allied - The courses related to Humanities and Social Sciences (H&SS) are a part of this level. They play a role of developing an human and social dimensions of personality of engineers. The courses of this level are basic or derived in nature from history, economics, law, sociology, psychology, management subject areas.

4.2.4. Applied technology - This level contains courses related to title of the programme viz. Civil engineering, Mechanical engineering etc. Every programme represents a sector of an economy and it prepares manpower that deals with design, production, and maintenance of entities related to the programme i.e. Civil engineering deals with building, roads, and automobile engineering related to motor vehicles as the entities

4.2.5. Diversified technology - This is fifth level of curriculum 06 in which types of courses are from diversified technology are included. This level exposes students to latest development in the field of study

4.2.6. Moreover courses are divided for administrative convenience into various categories as per following table: -

Sr No	Course Category	Details	Remarks if any
1	G	Courses common to all programmes and offered by allied departments	Courses from Foundation, Basic Technology and Allied levels i.e. 6G101 is Engineering Physics course which common to all programme and it is first course of foundation level

2	P	Courses common among	
3	Q	Course common among AE, CE, ME programmes	Courses from Basic Technology offered by APM, EE, i..e. Engineering Mechanics is designated as 6Q201
4	R	Courses common among AE and ME programmes	Basic Technology courses
5	T	Courses offered by IT department	
8	A	Course offered by AE department	
9	C	Course offered by CE department	
10	D	Courses offered by DDGM department	
11	E	Courses offered by EE department	
12	M	Courses offered by ME department	
13	X	Course offered by ETX department	

4.3. Teaching Scheme – It is in terms of engagement in hours per week. We provide three types of formal experiences viz. classroom (L), laboratorial (P) and tutorial (T) in which 1 hour engagement by teacher for any experiences per week and 1 hour students attendance means teacher delivers one credit and a student acquires one credit. Based on this philosophy teaching scheme is prepared for every course for engaging theory, practical and tutorials. Based on theory content and practical required course faculty members are empowered to prepare scheme with following guidelines

Range of Lecture creduts	1-4 hours
Range of practical credits	2/ 4 hours
Range of tutorial credits	1-2 hours

4.4. Evaluation Scheme – Evaluation Scheme means way students performance is to be assessed. Under Curriculum 06 we are aiming at extending Outcome based Education

4.5. Teaching strategies

4.6. Resources

Further for administrative convenience of examination cell and for devising alfa numerical course code, courses are further classified as per following table: -

Salient features of Curriculum 06

1. Total no. of courses required in a programme – **41** (including CNE courses)
2. Total credits of a programme – **190 +4** (including CNE)
3. Total marks of a programme – **4600 to 4700.**
4. No. of courses having theory papers in a programme – **29.**
5. Award of class courses **– 12.**
6. No. of award of class courses having theory papers – **10**
7. Total marks of award of class courses– **1900**
8. Th:Pr marks ratio – **(55 – 60) : (40 - 45).**
9. Th:Pr credits ratio – **(55 – 60) : (40 - 45).**
10. New CNE course 'Sports' introduced.
11. New course on 'Environmental Science' introduced.
12. Term end practical exam introduced for engineering graphics and engineering drawing.
13. Vocational Training as a separate course
14. Tutorials introduced for mathematical courses.
15. Some new courses related to advanced technology in the respective field of the programme are introduced.

5. Curriculum Implementation

Curriculum Implementation represents one of the important phases of curriculum development. It starts after curriculum design and curriculum development. As it converts a blue print in the form of a curriculum into reality, hence any institute should handle it very-very seriously. It is said- a good design and bad execution leads to a disaster.

In order to ensure right kind of curriculum implementation of curriculum 2011 here are clear and precise instructions to different class of people involved in its implementation:

5.1. **Instructions to programme heads-** Being a chief coordinator of a whole Learning Teaching Process (LTP) at a department level in implementing term curricula and the programme curriculum, which comprise of curricula of many courses, you have very important role to play. It is to canalize efforts of all courses faculty members not only of your department but also those of other departments. By doing so shall ensure achievement of predetermined programme objectives. In that case you are required to establish formal dialogue with all course faculty members and heads of the other departments, whose faculty member's input is equally important in successful curriculum implementation. You are expected to do following in order to achieve that:-

5.1.1. Prepare a department plan based on the institute term plan made available each time

5.1.2. Identify senior faculty and allocate him/her the portfolio of curriculum implementation and monitoring

5.1.3. Organise pre term commencement meeting of all faculty members

5.1.4. Guide them in preparing an integrated course plan of the course(s) they are going to teach considering five experiences viz. Classroom, laboratory, library, field, and experts lectures.

5.1.5. Ensure that they prepare a lesson plans and lab-sheets for related experiences.

5.1.6. Take term budget of consumables for implementing their courses.

5.1.7. Monitor curriculum implementation though internal mechanism.

5.2. **Instructions to Heads - Allied Department** Heads have a challenging role to play to participate in implementation of curricula of various programmes of other departments of the institute. They are required to remain as a link between HODs of the programme departments and faculty members of their department. Hence they are expected to ensure following: -

5.2.1. Establish liaison with all programme heads to which the department offers services.

5.2.2. Seeks information about the other courses being offered in the ensuing term by various programme departments.

5.2.3. Guide faculty members of your department in order to ensure that the course they teach is getting linked with the other courses in a semester

5.3. **Instructions to course faculty**

Being a course faculty member you have a very important role of converting revised curriculum into results. You are a person behind achieving programme objectives. For that you are required to do following things: -

5.2.1 Read & comprehend programme objectives.

5.2.2 Understand course level objectives of the course you are going to teach in ensuing semester.

5.2.3 Understand objectives of the course(s) you are going to teach.

5.2.4 Prepare course plan, lesson plans and lab sheets in advance to implement the course curriculum effectively.

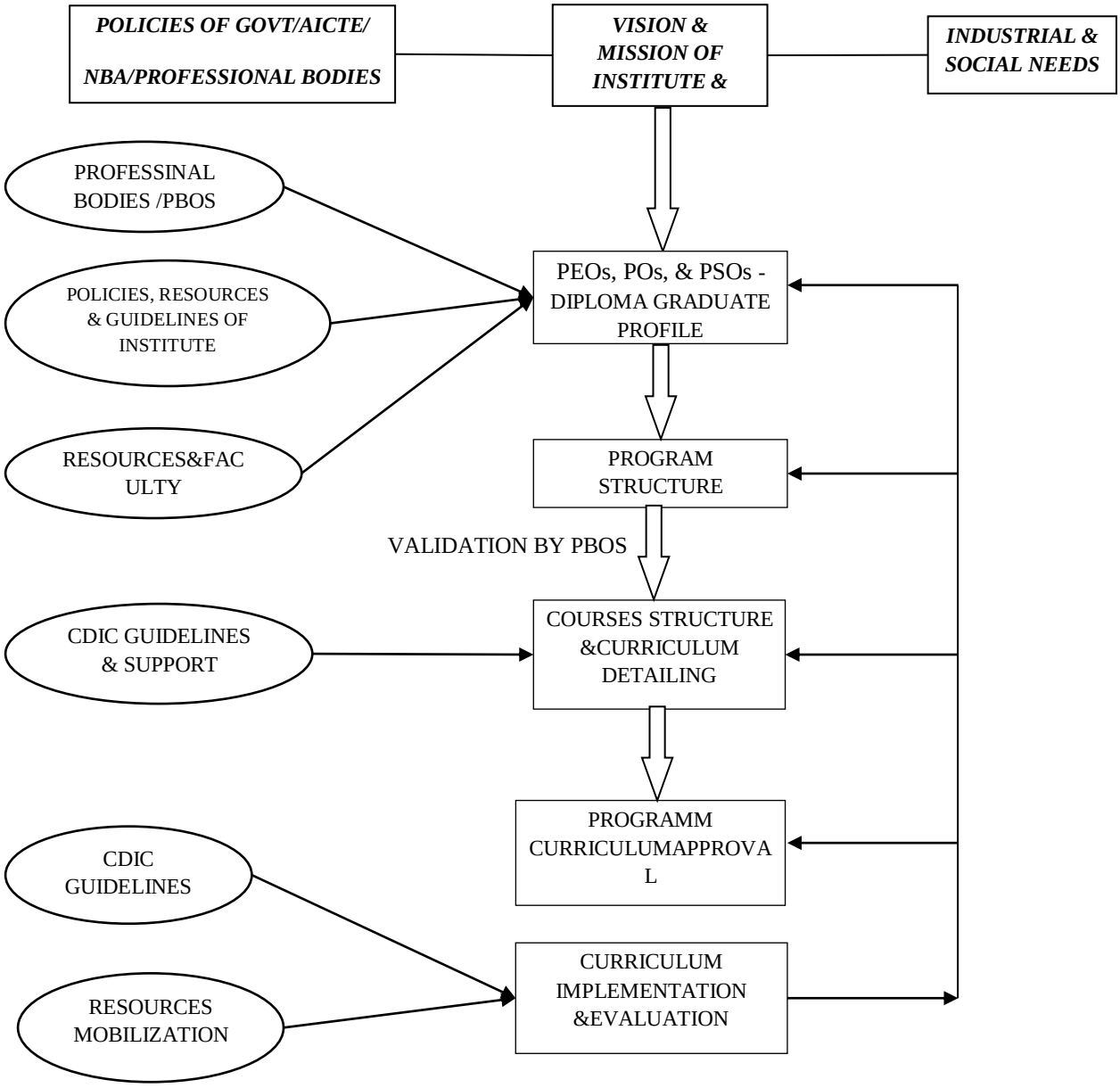
5.2.5 Provide budget for consumables required

5.4. **Examination Cell**

Apart from framing and implementing its own curricula, the institute is empowered to conduct its own examination. Examination cell plays a vital role in curriculum evaluation process. Evaluation process parameters included in course curriculum are executed; rules, regulations and guidelines approved by Examination Committee and Governing Body are followed in this regard. The academic activities schedule is declared at the beginning of the term and is strictly followed. Experts from industries and academia are involved in the student's evaluation process.

6. EPILOGUE

Curriculum 06 is an Interdisciplinary – integrated curriculum in which integrated curriculum frame work comprising of various models is used. It is the curriculum using which GPA is intending to provide Outcome Based Education at diploma level education



CURRICULUM DEVELOPMENT APPROACH

Skill identification has been done after analysing the feedbacks of alumni, students and faculties, suggestions from search conference, PBOS members and industry persons.

Sr. No.	Type of skills	List of skills
1.	Technical Skills	1. Supervision of production of Auto component. 2. Supervision of Service and repair of vehicle. 3. Inspection and report writing of insured vehicle. 4. Analysis, design and costing of product and process 5. Diagnosis of defect in motor vehicle 6. Vehicle application development. 7. Troubleshoot & Maintain vehicle systems. 8. Design and Development of automobile subsystems.
2.	Soft Skills	1. Communication (Oral & Written) 2. Team work 3. Problem solving 4. Develop lifelong learning 5. Multidisciplinary Practices 6. Recourse management 7. Time management 8. Creativity 9. Presentation skills 10. Leadership

Programme Educational Objectives (PEOs)

PEO1: To pursue a successful carrier in Automobile Industries and related fields by solving problems using education training acquired.

PEO2: To remain updated about latest development in field of Automobile Engineering.

PEO3: To work in multidisciplinary and cross cultural teams and contributes towards individuals society and sustainability.

M1	**To Pursue relevant education.**
M2	**To Educate and train individuals, Professionals, technicians and skilled workforce for wage and self-employment.**
M3	**To Develop world class Curriculum and Passionate staff member.**
M4	**To establish student centric academic system.**

PEO Statements	**M1**	**M2**	**M3**	**M4**
PEO1: To pursue a successful carrier in Automobile Industries and related fields by solving problems using education training acquired.	**3**	**3**	**3**	**2**
PEO2: To remain updated about latest development in field of Automobile Engineering	**3**	**3**	**2**	**3**
PEO3: To work in multidisciplinary and cross cultural teams and contributes towards individuals society and sustainability.	3	**3**	**2**	**3**

Programme Specific Outcomes (PSO)

PSo1: To supervise production quality of motor vehicle and their system.

PSo2: To supervise service and repair of motor vehicle.

PROGRAMME STRUCTURE

Allied Course

COURSE CLUSTER ALLIED COURSE (1)

SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR/OR	Total
CAC	COMPULSORY ALLIED COURSES									
1	6G301	English	2	2	4	20	25	80	0	125
2	6G302	Communication skills	1	2	3	0	50	0	OR 25@	75
3	6G303	Development of Life Skills	0	2	2	0	25	0	OR 25@	50
4	6G304	Environ Science	0	2	2	0	50	0	00	50
5	6G305	IndustrialOrganization& Management	3	2	5	20	25	80	0	125
6	6G306	EDP	2	2	4	0	50	0	0	50
7	6A301	History of Automobile	2	1	3	0	25	0	OR 25@	50
8	6A302	Legal Aspect of Motor vehicle	3	2	5	20	25	80	OR 25@	150
OAC	OPTIONAL ALLIED COURSES I (any one)									
9	6A303	Auto Service Management	3	2	5	20	25	80	OR 25#	150
9	6A304	Transport Management	3	2	5	20	25	80	OR 25#	150
OAC	OPTIONAL ALLIEDCOURSES II (any two)									
10	6G311	Non-Exam Course-I(6G311 Onwards)	0	2	2					0
11	6G311	Non-Exam Course-II(6G311 Onwards)	0	2	2					0
		Total	16	21	37	80	300	320	125	825

Foundation Course

COURSE CLUSTER FOUNDATION (2)

SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR/OR	Total
1	6G101	Basics Mathematics	3	1	4	20	0	80	0	100
2	6G102	Engineering Mathematics	3	1	4	20	0	80	0	100
3	6G103	Engineering Physics	3	2	5	20	25	80	25@	150
4	6G104	Engineering Chemistry	3	2	5	20	25	80	25@	150
			12	6	18	80	50	320	50	500

Basic Technology Course

COURSE CLUSTER BASIC TECHNOLOGY (3)

SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR/OR	Total
1	6Q201	Engineering Mechanics	4	2	6	20	25	80	0	125
2	6R202	Strength of Material	3	2	5	20	50	80	0	150
3	6G202	Workshop Practice	0	3	3	0	50	0	0	50
4	6G201	Engineering Graphics	2	2	4	0	50	0	PR 50@	100
5	6G203	Basics of Computer Systems	0	2	2	0	25	0	PR 25@	50
6	6R203	Basics of Electrical & Electronics Systems	4	2	6	20	50	80	0	150
7	6R201	Engineering Drawing	2	4	6	0	50	0	PR 50@	100
8	6A206	Basic Manufacturing Processes	3	3	6	20	50	80	PR 50#	200
9	6A201	Mechanics of Thermal System	3	2	5	20	25	80	OR 25#	150
10	6A202	Mechanics of Fluid System	3	2	5	20	25	80	0	125
11	6A203	Automobile Materials	3	2	5	20	25	80	OR 25#	150
12	6A204	Automobile Mechanisms	3	2	5	20	25	80	0	125
			30	28	58	160	450	640	225	1475

Motor Technology Course

COURSE CLUSTER: MOTOR TECHNOLOGY (4)

SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR/OR	Total
1	6A401	Bicycle Technology	1	2	3	0	25	0	OR 25@	50
2	6A402	Auto Body Technology	2	3	5	20	25	80	OR 25@	150
3	6A403	Auto Engine Technology	3	2	5	20	25	80	OR 25#	150
4	6A404	Advance Auto Engine Tech.	3	2	5	20	25	80	OR 25#	150
5	6A405	Auto Transmission Tech.	2	3	5	20	25	80	OR 25#	150
6	6A406	Auto Systems Technology	3	2	5	20	25	80	OR 25#	150
7	6A407	Auto Elect and Etx Tech	3	2	5	20	25	80	OR 25#	150
8	6A408	Auto Servicing & Repair Tech	3	2	5	20	25	80	0	125
9	6A410	Automobile CAD	0	4	4	0	25	0	PR 25@	50
10	6A411	Auto Component Design	3	2	5	20	25	80	OR 25@	150
		Total	23	24	47	160	250	640	225	1275

Diversified Technology Course

COURSE CLUSTER		DIVERSIFIED TECHNOLOGY (5)								
SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR/OR	Total
CDC	COMPULSORY DIVERSIFIED COURSES									
1	6A505	Motor Vehicle Driving Practice	0	4	4	0	0	0	OR25 @	25
2	6A503	Industrial Training	0	14	14	0	200	0	OR 100 # PR 50 #	350
4	6A501	Seminar	0	2	2	0	25	0	OR 25@	50
5	6A502	Project	0	4	4	0	50	0	OR 100#	150
ODC1	OPTIONAL DIVERSIFIED COURSES (any one)									
3	6A506	Two Wheeler Technology	3	2	5	20	25	80	0	125
4	6A507	Special Purpose Vehicle Techno	3	2	5	20	25	80	0	125
ODC2	OPTIONAL DIVERSIFIED COURSES (any one)									
5	6A508	Auto Mechatronics Technology	3	2	5	20	25	80	0	125
7	6A509	Auto HVAC Technology	3	2	5	20	25	80	0	125
		Total	6	28	34	40	225	160	400	825

Award (Degree) of Class Course for 06 Curriculum.

SR NO	COURSE CODE	COURSE NAME	TEACHING SCHEME			EVALUATION SCHEME				
			L	P/T	T	PROGRESSIVE		TERMEND		
						PT	ST/ TW	EE	PR	Total
CDC	COMPULSORY DIVERSIFIED COURSES									
1	6A302	Legal Aspect of Motor Vehicle	3	2	5	20	25	80	OR 25@	150
2	6A402	Auto Body Technology	2	3	5	20	25	80	OR 25@	150
3	6A403	Auto Engine Technology	3	2	5	20	25	80	OR 25#	150
4	6A404	Advance Auto Engine Technology	3	2	5	20	25	80	OR 25#	150
5	6A405	Auto Transmission Technology	2	3	5	20	25	80	OR 25#	150
6	6A406	Auto Systems Technology	3	2	5	20	25	80	OR 25#	150
7	6A407	Auto Elect. And Etx. Technology	3	2	5	20	25	80	OR 25#	150
8	6A408	Auto Servicing & Repair Technology	3	2	5	20	25	80	0	125
9	6A411	Auto Component Design	3	2	5	20	25	80	0	125
10	6A502	Project	0	4	4	0	50	0	OR 100#	150
ODC1	OPTIONAL DIVERSIFIED COURSES (any one)									
3	6A506	Two Wheeler Technology	3	2	5	20	25	80	0	125
4	6A507	Special Purpose Vehicle Techno	3	2	5	20	25	80	0	125
ODC2	OPTIONAL DIVERSIFIED COURSES (any one)									
5	6A508	Auto Mechatronics Technology	3	2	5	20	25	80	0	125
7	6A510	Auto HVAC Technology	3	2	5	20	25	80	0	125
		Total								1700

Sample Path

SEM	I	II	III	IV	V	VI
1	English 6G301 02+02 =4	Communication 6G302 1+2=3	History Of Auto 6A301 2+1=3	Basic Manufacturing Process 6A206 3+3 =6	Industrial Training 6A503 0+14=14	Legal Aspect s of MV 6A302 3+2 =5
2	EnggChemistry 6G104 3+2 =05	EnggPhysics 6G103 3+2= 5	Mechanics of Thermal Systems 6A201 3+2 =5	Elective 1 6A506-07 3+2=5	Seminar 6A501 0+2=2	Ind Org Mgmt 6G305 3+2=5
3	Basic Maths 6G101 3+1 =04	EnggMaths 6G102 3+1=4	Basic Elect &Etx 6R203 4+2 =6	Auto Elect &Etx. 6A407 3+2 =5	Project 6A502 0+4=4	Elective 3 6A303-04 3+2 =5
4	Engg. Graphics 6G201 2+2 =04	Engg Drawing 6R201 2+4 =6	Entrepreneurship Dev. 6G306 2+2=4	Mechanics of Fluid Systems 6A202 3+2=5	Motor Vehicle Driving practice 0+4 =04 6A505	Auto Service &Repair Tech 6A408 3+2=5
5	Basic Comp Sys 6G203 0+2 =02	Engineering Mechanics 6Q201 4+2 =6	Strength of Material 6R202 3+2=5	Auto Body Tech 6A402 2+3=5	Auto Sys Technology 6A406 3+2=5	Auto Comp Design 6A411 3+2 =5
6	Environ Science 6G304 0+2 =02	BicycleTechnology 6A401 1+2 =3	Auto Materials 3+2=5 6A203	Auto Engine Tech 3+2=5 6A403	Elective 2 6A508 -09 3+2=5	Auto CAD 6A410 0+4=4
7	Basic W/s Practice 6G202 0+3 =03	Dev. Of Life Skills 6G303 0+2=2	Auto Mechanism 6A204 3 +2=5	Auto Trans Technology 6A405 2+3=5		Advance Auto Engine Tech 3+2=5 6A404
8		Non-exam Course I 6G311 Onwards 0+2 =2	Non-exam Course II 6G311 Onwards 0+2=2			
	7/24	**8/31**	**8/35**	**7/36**	**6/34**	**7/34**

COURSE TITLE ENGLISH
COURSE CODE 6G301

Diploma Programme in which this course is offered	Semester in which offered
AE	First

1. RATIONALE

English language has become a supreme necessity to pick up a solid core of knowledge. It has a power of linking us with the outside world. Competency in English is also important in business matters like transactions including e-mails, memos, reports and contracts in writing of only for Indian industry, but also worldwide. Students having proficiency in reading, writing and speaking English has become a prospect of employment in the industry. Hence, this course is designed to help the students to communicate in English effectively.

2. COMPETENCY

At the end of studying this course students will be able to

"Communicate in English language in spoken and written form."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PT	ESE	PA	
2	-	2	4	80	20	-	25*	125
Exam Duration				3 Hrs	1 Hr	-	-	-

(*): *Out of 25 marks, 05 marks -micro-project assessment; 20 marks-progressive assessment.*

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PT**- Progressive Test; OR-Oral Examination; **PA**- Progressive Assessment

4. COURSE OUTCOMES

1. Interpret the meaning of new words from the text.
2. Formulate grammatically correct sentences using new words.
3. Prepare resume in proper format.
4. Use relevant vocabulary to construct sentences.

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT-I Comprehension	1a. Understanding meaning of new words from the text.	**Text from the book & Vocabulary Building** 1.1.Man Versus Machine—

	1b.Write summary of the text 1c. Responding to the questions from the text 1d. Express ideas and views on learned topics	M..K..Gandhi 1.2. Say No to Plastic Bags 1.3. Interview of Dr.A.P.J.AbdulKalam 1.4. Dare to Dream- N.R.Narayan Murthy 1.5. The History Maker—MaltiHola
UNIT-II Functional Grammar	2a. Apply correct verbs in given sentences 2b. Use of correct structures in writing 2c. Identify different types of sentences 2d. Apply correct auxiliaries 2e. Use appropriate connectors in the given sentences 2f. Use appropriate prepositions in the given sentences 2g. Apply correct and exact rules and structures to transform the sentences 2h. Use of correct punctuations in writing	**Functional Grammar** 2.1.Tenses & Time 2.2. Sentence Patterns 2.3. Types of Sentences 2.4. Modal Auxiliaries 2.5. Connectors 2. 6. Prepositions 2.7. Voice, Degree and Reported Speech 2.8. Punctuation Marks
UNIT-III Craft of writing	3a. Writing a paragraph effectively 3b. Writing e-mail in proper formats 3c. Prepare resume in suitable format	3.1.Paragraph Writing 3.2.E-mail writing 3.3. Resume Writing
UNIT-IV Listening & Speaking Skills	4a. Formulate sentences using new words 4b. Enrich vocabulary through reading and listening 4c. Follow correct pronunciations, intonations & accents in communication	4.1. Importance of effective listening 4.2.Barriers in listening and how to overcome them 4.3Problems in speaking English faced by Indian Students

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Text from the book & Vocabulary Building	12	08	12	10	30
II	Functional Grammar	12	05	08	13	26
III	Craft of Writing	06	04	04	08	16
IV	Listening & Speaking Skills	02	02	02	04	08
	Total	**32**	**19**	**26**	**35**	**80**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

7. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1.	I	Make Sentences Using Correct Collocations	04
2.	II	Frame Sentences Using Appropriate Preposition/Conjunction	04
3.	III	Make Sentences Using Correct Tenses	04
4.	IV	Make Sentences Using Seven Basic Sentence Patterns	04
5.	V	Transform Sentences in Reported Speech	04
6.	VI	Prepare an Effective Resume in a Proper Format	04
7.	VII	Draft Formal E-mails	04
8.	VIII	Listen a Paragraph/Speech/Story and Make a Summary	04
Total			**32**

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

a. Read newspapers daily.
b. Solve exercises on lexical items.

c. Use apps for practice.
d. Use pocket dictionary to increase vocabulary.
e. Listen the news bulletin on radio.
f. Play different word games to improve vocabulary.
g. Write different articles & posts.
h. Practice role-playing.
i. Write a story of own experiences.
j. Practice listening comprehension.
k. Collect articles from newspapers & make a collection.
l. Practice paragraph writing.
m. Collect different business letters.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

a. Arrange different competitions to solve various grammatical items.
b. Motivate students to listen, speak, read and write English in their day-to-day life.
c. Student centered methods and techniques of teaching and learning e.g. group discussion, role-play, individual and group assignments should be used so as to make the students actively participate in the teaching-learning process.

10. SUGGESTED TITLES FOR MICRO-PROJECTS

A micro-project is planned to be undertaken by a student. He/she ought to submit it by the end of the semester to develop the industry oriented COs. The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty**:**

a. The use of English language in the user manual of electronic appliances used at home.
b. Prepare an advertisement for five daily used products using contextual vocabulary.
c. Observe environmental problems in your locality and frame at least ten slogans to createan awareness.
d. Take an interview of any successful person in your locality in context with his life journey, inspiration, social contribution, role model and keys to success.
e. Prepare a leaflet giving information about your institute.
f. Write a review of your favourite movie/drama/novel.
g. Find out the difficulties in speaking English faced by the students from rural areas.

11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	English Grammar & Composition	R. C. Jain	Macmillan
2	Business Letters & E-mails	JyotiNandedkar	Saket Pub.
3	Business Correspondence and Report writing	R. C. Sharma & Krishna Mohan	Tata McGraw Hill
4	Contemporary English Grammar	David Green	Macmillan
5	A Communicative Grammar of English	Geofray Leech &Jansvartvik	Pearson Education
6	*Spectrum- A Text Book on English	-	MSBTE
7	* A Text Book on English	-	MSBTE

12. Major Equipments/ Instruments with Broad Specifications

Sr.No.	Name of the Equipment	Specification
1	Digital English Language Laboratory	
2	Computers and Headphones	
3	Magazines,Articles,Journals in Lab.	

13. E-learning resourses

(Please mention complete URL of the E- resourses CO wise)

1	https://www.nptel.ac.in/courses
2	https://www.k12reader.com
3	https://www.eduaction.com
4	https://www.k5learning.com
5	https://www.english4u.com

POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	Interpret the meaning of new words from the text.	3	1	1	1	1	1	1	1	3	1	-	-	-
CO2	Formulate grammatically correct sentences using new words.	3	1	1	1	1	1	1	1	3	1	-	-	-
CO3	Prepare resume in proper format.	1	1	2	1	3	3	2	3	3	3	-	-	-
CO4	Use relevant vocabulary to construct sentences.	1	1	1	1	1	1	1	1	2	1	-	-	-

Sr. No	Name of the faculty member	Designation and Institute
1	Mrs. P.Y. Kamble	Lecturer in English, Government Polytechnic, Aurangabad
2	Mrs. M.S. Ban	Lecturer in English, Government Polytechnic, Aurangabad
3	Mr. P.V. Deshmukh	Lecturer in English, Government Polytechnic, Aurangabad
4	Mr. R.L. Korde	Lecturer in English, Government Polytechnic, Aurangabad
5	Mr. D.D. Gangthade	Lecturer in English, Government Polytechnic, Aurangabad
6	Mr. A.P. Jagtap	Lecturer in English, Government Polytechnic, Osmanabad

Member Secretary PBOS Chairman PBOS Co-coordinator science and Humanities

COURSE TITLE ENGINEERING CHEMISTRY

COURSE CODE 6G104

Diploma Programme in which this course is offered	**Semester in which offered**
AE	First

1 RATIONALE:

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications and selection of materials for specific engineering applications/work/job.

Due to technological progress, there are hazardous effects of chemicals, waste water and sewage water on environment & human life. The core knowledge of environmental effects will bring awareness; generate curiosity in students about the precautions & preventions to be taken to carry out further development resultantly to reduce the ill effects.

2. COMPETENCY:

At the end of studying this course students will be able to

"**Apply basic knowledge and principles of chemistry to solve different industrial problems."**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme					
				Theory Marks		Practical Marks		Term work	Total Marks
L	T	P	C	ESE	PT	ESE	PA	ESE	TOTAL MARKS
3	0	2	5	80~	20~	25@	00	25	150
Examination Duration				2Hrs	1/2Hr.	2Hrs.	--	--	--

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PT** - Progressive Test; OR-Oral examination; **PA** - Progressive Assessment(PR); ~Online Multiple choice examination. @ Internal Examination

3. COURSE OUTCOMES:

After providing classroom teaching and laboratory experiences related to this course, students will be able to

1. Draw the orbital configuration of different elements.
2. Represent the formation of molecules schematically.
3. Compare and use different types of cells.
4. Identify the properties of metals & alloys related to engineering applications.

5. Identify the properties of nonmetallic materials, related to engineering applications.
6. Select a proper material for specific purpose.
7. Select and use the lubricants at proper/ specific conditions of machines.

4. COURSE DETAILS:

Unit	Major Learning Outcomes	Topics and Sub-topics
UNIT-I Electronic Theory Of Valency & Molecule Formation	1a.Identification of structure and nature of atom, element and molecule.	1.1 Atomic no, atomic mass no. numerical problems on it , orbit & orbitals. 1.2 Electronic configuration, electronic configuration of first 30 elements. 1.3 Molecule formation: Valency, types of valency, electrovalency and covalency with suitable examples. Study of Formation of Electrovalent compounds e.g. NaCl, $CaCl_2$ & $MgCl_2$ and formation of Covalent Compounds examples H_2O, Cl_2, CO_2, N_2
UNIT-II Electrochemistry	2a.Verify Principle, construction, working and applications of different cells.	2.1 Arrhenius Theory of Ionization, Degree of ionization. 2.2 Basic concepts of Conductors, Insulators, Dielectrics, Electrolyte, Non Electrolyte 2.3 Electrolysis, Electrolytic Cell, Electrodes. 2.4 Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode 2.5 Faraday's first law of Electrolysis & numerical problems on it Application of Electrolysis such as Electroplating. 2.6 Electrochemical Cells & Batteries Types of cell Primary & secondary cell construction And Working of Dry cell & Lead – Acid Storage.

UNIT III Metals and Alloys	3a.Identify different mechanical properties and extraction methods of pure metal, Correlate properties, composition and applications of alloys with metal.	3.1 Definition of Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Occurrence of Metals. 3.2 Mechanical Properties of metals such as hardness, Toughness, ductility, malleability, tensile strength. 3.3 Stages of Extraction of Metals from its Ores in detail i.e. its flow sheet Crushing, Concentration, methods of concentration (physical and chemical). 3.4 Reduction of iron in blast furnace with chemical reactions, Reactions in zone of reduction. **Alloys** 3.5 Definition of Alloy, Purposes of Making alloy. 3.6 Methods of Preparation of alloy such as fusion method & compression method 3.7 Classification of Alloys, Ferrous alloys & Non Ferrous alloys, their examples. 3.8 Composition, Properties & Applications of some common alloys such as Alnico, Duralumin, Wood's Metal
UNIT-IV Corrosion of Metals And its Application	4a. Classify corrosion from action of surrounding environment and its protection methods.	4.1 Definition of corrosion 4.2 Atmospheric corrosion or dry Corrosion, corrosion due to oxygen , different types of film formation. 4.3 Electrochemical Corrosion Hydrogen evolution mechanism. 4.4 Appling protective Coatings like metal coating by galvanising, tinning
UNIT-V Water	5a. Recognize ill effect of hard water and methods for purification of water.	5.1 Hard water & soft water, types of hardness, causes of hardness 5.2 Effects of hard water in different industries (such as paper , sugar , dying and textile industries) and domestic purposes. 5.3 Softening of hard water by Permutit process and ion exchange process,. 5.4 Potable water & its condition for pot-ability. Different methods of purification of water for drinking purposes chlorination and ozonation 5.5 pH – value of water its applications Numericals on pH values.

UNIT-VI Non Metallic Materials	6a. Identification of types , preparation, properties and applications of plastic, rubber and thermal insulating material.	6.1 Plastics Definition of Plastic, Formation of Plastic by Addition Polymerisation with examples Polyethylene & PVC. 6.2 Formation of Plastic by Condensation Polymerisation with suitable example as Nylon 6, 6; Bakelite plastic. 6.3 Types of Plastics, Thermo softening & Thermosetting Plastic & difference between them. 6.4. Engineering properties of plastic and its related uses. **RUBBER** 6.5 Natural rubber its extraction from latex, drawbacks of natural rubber. Synthetic Rubber its examples 6.6 Vulcanisation of rubber with chemical reaction. 6.7 Properties of rubber such as elasticity, tack, resistant to abrasion, rebound capacity. 6.8 Engineering Applications of rubber based on its properties. 6.9 Thermal insulating materials Definition & characteristics of ideal thermal insulator. **Glass wool** preparation, properties & applications. **Thermocole** properties and its applications.
Unit-VII Lubricants	7a. Select proper lubricant for different types of machineries.	7.1 Definition of lubricant and Lubrication. 7.2 Functions of lubricants. 7.3 Classification of lubricants with examples, 7.4 Mechanism of Lubrication by Fluid Film, Boundary & Extreme Pressure, 7.5 Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, Cloud & Pour Point. 7.6 Selection of proper Lubricants for Various types of machines.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Electronic Theory of Valency and Molecular Formatin	8	2	6	4	12
II	Electrochemistry	6	2	8	2	12
III	Metals and Alloys	8	2	8	4	14
IV	Corrosion of Metals and it's Applications	6	2	4	2	8
V	Water	7	2	2	6	10
VI	Non Metallic Materials	7	4	8	4	16
VII	Lubricants	6	2	4	2	8
Total		**48**	**16**	**40**	**24**	**80**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and psychomotor skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

(Any TEN from following)

Sr. No.	Unit No.	Practical Exercises	Approx. Hrs. required
1	1	Write Orbital electronic configuration of different elements (First 30 elements)	2
2	2	Verify Faraday's first Law of electrolysis.	2
3	7	Find the normality & strength in grams per liter of the given solution (NaOH) with the help of standard hydrochloric acid.	2
4	5	Determine pH value of given solutions, water samples, by using, universal indicator and pH meter.	2
5	7	Determine the normality & strength of given hydrochloric acid solution by titrating it against standard potassium hydroxide solution.	2
6	3	Determine percentage of iron from steel by titration method.	2
7	5	Determine the hardness of potable water and boiler feeding water.	2
8	5	Determine the chloride content potable water and boiler feeding water.	2
9	6	Prepare phenol formaldehyde resin.	2
10	7	Determine the acid value of oil sample by neutralization method.	2

11	2	Qualitative analysis of given salt solutions, i.e. to determine one acidic and one basic radical from given salt solution. (At least 05 salt solutions.)	For each salt solution 2
Micro Project (Any one of following will be opted by a group of 5-6 students)			
Sr. No.	**Unit No.**	**Practical Exercises**	
1	1	Prepare power point presentation to show/demonstrate covalent bond, ionic bond.	
2	4	Effect of acid or alkali on rate of corrosion for different metals.	
3	5	Study of hard and soft water of different samples of water	
4	2	Study of mechanism and working of different batteries.	
5	2	Preparation of small scale batteries/ Galvanic cells. Collect chemicals and material from lab and household and prepare working model of cell.	
6	6	Collect different polymers and prepare the chart on the basis of its type, properties and uses.	

7. SUGGESTED STUDENT ACTIVITIES

a. Verify the properties of different types of compounds used in day to day life.
b. Differentiate properties and uses of different metals.
c. Differentiate composition, properties and application of different alloys.
d. Co-relate the effect of acidic environment with neutral environment.
e. Library survey regarding engineering chemistry topics regarding curriculum.
f. Animated Power point presentation containing current research development related to topics mentioned in curriculum.

8. SPECIAL INSTRUCTIONAL STRATEGIES

a. Search various sites to teach various topics/sub topics.
b. Instead of the traditional lecture method, use different types of teaching methods such as improved lecture method, question answer method, laboratory method to attained specific outcome.
c. Some topics are relatively simpler in nature is to be given to the students for self-learning by seminar or by classroom presentations
d. Teachers provide theme to create multiple choice questions.
e. Provide super visionary assistance for completion of micro-projects.

9. SUGGESTED LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons Co. **ISBN 9789352160006**
2	Engineering Chemistry	S. S. Dara	S. Chand Publication **ISBN 8121903599**
3	Chemistry of Engineering Materials	S.N. Narkhede	Nirali Prakashan

10. MAJOR EQUIPMENTS/ INSTRUMENTS WITH BROAD SPECIFICATIONS

Sr. No.	Name of the Equipment	Specification
1	pH meter	Digital ,Range 0 to 14 with Sensitive Glass electrode
2	Distilled water plant	S.S. plant with 15 lit capacity with 2Kv heating coil
3	Kipps's Apparatus	Airtight three section apparatus
4	Electrolytic cell for verification of Faraday's first law	Battery 24V and 5 Ampere , Rheostat 1000 Ohm, Wire, Ammeter 0 to 5 Ampere, Copper plate 3" x 6 " inch

11. E-LEARNING RESOURCES

(Please mention complete URL of the E- resourse CO wise)

Sr. No.	Web Address
1	http://www.webelements.com
2	http://www.chemtutor.com
3	http://www.chem1.com
4	https://phet.colorado.edu
5	www.visionlearning.com
6	www.onlinelibrary.wiley.com
7	www.rsc.org
8	www.chemcollective.org

12. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	Draw the orbital configuration of different elements.	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Represent the formation of molecules schematically.	3	2	2	1	-	-	-	-	-	-	-	-	-
CO3	Compare and use different types of cells.	3	3	-	1	-	-	-	-	-	-	-	-	-
CO4	Identify the properties of metals & alloys related to engineering applications.	3	3	2	1	-	-	-	-	-	-	-	-	-
CO5	Identify the properties of nonmetallic materials, related to engineering applications.	3	3	1	2	-	2	-	-	-	-	-	-	-
CO6	Select a proper material for specific purpose.	2	2	2	1	1	1	-	-	-	-	-	-	-

CO7	Select and use the lubricants at proper/ specific conditions of machines.	2	2	2	1	1	1	-	-	-	-	-	-	-

13. Name and Designation of Course Designer:

Sr. No	Name of the faculty member	Designation and Institute
1	Dr. H.R. Shaikh	Lecturer in Chemistry, Government Polytechnic, Aurangabad
2	Dr. Devdatta V. Saraf	Lecturer in Chemistry, Government Polytechnic, Aurangabad
3	Mrs. R.A. Nemade	Lecturer in Chemistry, Government Polytechnic, Aurangabad
4	Mr. P.K. Shewalkar	Lecturer in Chemistry, Government Polytechnic, Jalna

Member Secretary PBOS Chairman PBOS Co-coordinator science and Humanities

COURSE TITLE **BASIC MATHEMATICS**

COURSE CODE **6G101**

Diploma Programme in which this course is offered	Semester in which offered
AE	First Semester

1 RATIONALE

This course is classified under foundation level courses and intends to teach students basic facts, concepts and principles of mathematics, as a tool to analise engineering problems. Diploma engineers have to solve the problems in engineering.
Basic mathematics is an attempt to initiate the multi-dimensional logical thinking and reasoning capabilities of the students.

2 COMPETENCY

At the end of studying this course students will be able to
"**Solve engineering problems by using analytical and systematic approach.**"

3 COURSE OUTCOMES

Students will be able to

1. Apply rules of Logarithms in solving simple engineering problems
2. Solve simultaneous equations using concepts of Determinants and Matrices
3. Solve simple engineering problems using concepts of Partial Fractions
4. Solve simple engineering problems by applying formulae of trigonometry.
5. Solve simple engineering problem of function using the different definition of Function
6. Solve simple engineering problem of function using the rules of Limits.

4 TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PT	ESE	PA	
03	01	--	04	80	20	--	--	100
Exam Duration				03 Hrs.	01 Hr.			

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice(batch-wise); **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PT** - Progressive Test; OR-Oral examination

5 COURSE DETAILS:-

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit I Revision	1a.To recall/know the basic concept of Logarithms and Determinant of order 2and3	1.1 Logarithms 1.2 Definition natural and common logarithms. 1.3 Laws of logarithm . 1.4 Definition of Determinant, Order of Determinant. 1.5 Expansion of Determinant of order 2 and 3. 1.6 Properties of Determinant.
Unit II Determinant And Matrices	2a.Students will be able to Solve simultaneous equations using concepts of Determinants and Matrices	2.1 Cramer's Rule. (solution of simultaneous equations in two and three unknowns) 2.1 Definition of matrix: Type of matrix: viz.- null, row, column, Square, diagonal, scalar, unit, Triangular. 2.2 Algebra of matrices –addition, subtraction and multiplication . 2.3 Transpose of a matrix. 2.4 adjoint of a matrix Relation. 2.5 Inverse of matrix by adjoint method. 2.6 Solution of simultaneous equations in two and three Unknowns using Inverse of matrix method .
Unit III Partial Fractions	3a.Students will be able to solve simple problems Using concepts of Partial Fractions	3.1 Definition of Partial fraction, proper and improper fractions, rational fractions. 3.2 To resolve given rational fraction into partial fractions. 3.3 Denominator containing non repeated linear factors. 3.4 Denominator containing repeated linear factors. 3.5 Denominator containing irreducible non-repeated quadratic factors.

		3.6 Different types of examples.
Unit IV Trigonometry	4a.Students will be able to Solve simple problems by applying using concepts of trigonometry.	4.1 Trigonometric ratios of allied, compound and multiple angles. 4.2 Trigonometric Ratios of allied angles. 4.3 Trigonometric Ratios of compound angles. 4.4 Trigonometric Ratios of multiple angle Product, sum and difference formulae. 4.5 Sub-multiple angles. 4.6 Definition of inverse trigonometric, ratios. 4.7 Principal value of inverse trigonometric ratios. Relation between inverse trigonometric ratios. 4.8 Examples on inverse circular functions.
Unit V Function	5a.Students will be able to Solve the problem of function using the concept of Function	5.1 Cartesian products of sets. 5.2 Definition of relation, definition of function, real value. Function, domain, co-domain of a function. 5.3 Types of Functions. 5.4 Value of the function at given point . 5.5 Composite function. 5.6 Different types of examples on functions .
Unit VI Limits	6a. Students will be able to Solve the problem of function using the concept of Limit	6.1Definition and concept of limit, limits of algebraic functions. 6.2 Limits of trigonometric functions. 6.3 Limits of exponential functions. 6.4 Limits of logarithmic functions.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Revision	02	0	0	0	0
2	Determinants and Matrices	12	04	08	12	24
3	Partial Fractions	06		04	04	08
4	Trigonometry	14	04	08	12	24
5	Function	04	02	02	04	08
6	Limits	10	04	04	08	16
	TOTAL	**48**	**14**	**26**	**40**	**80**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7 SUGGESTED EXERCISES/PRACTICAL/TUTORIAL

1) The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills so that students are able to acquire the competencies.

2) Form a batch of 20 students and at least 10 problems should be given to get necessary exercise.

Sr. No.	**Title/Topic**	**Exercises/Tutorial**	Approx. hours
1	Determinants and Matrices	Solving problems on cramer's rule Examples on Matrix Addition/Subtraction and Product Co-factors, Ad joint and Inverse of Matrix Solution of Simultaneous Equation using 3X3 Matrix and its Applications	02 02 02

2	Partial Fractions	Examples related Definition and cases	02
3	Trigonometry	Practice Examples: Allied & Compound Angles. Examples related inverse trigonometric ratios	04
4	Function	Examples related Definition and Rules.	02
5	Limits	Examples related to different types of function.	02

8. SUGGESTED STUDENT ACTIVITIES

--------N.A.-----

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1 Chalk-board method.
2 Projector method.
3 Tutorial method.

10. SUGGESTED LEARNING RESOURCES

Sr. No.	**Title of Book**	**Author**	**Publication**
1	Mathematics for polytechnic students for first year	S.P.Deshpande	Pune vidhyarti gruh prakshan Pune
2	Mathematics for polytechnic students for first year	G.V.Kumbhojkar	Phadke prakashan Kholapur
3	Mathematics for polytechnics	TTTI Bhopal	TTTI Bhopal

11 Major Equipment/ Instrument with Broad Specifications

Sr.NO.	Name of the Equipment	Specification
	NA	

12. Software/Learning Websites

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13. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PSO2	PSO3
CO1	To able the basic concept of Logarithms and Determinant of order 2 and 3	1	1	0	0	0	0	0	0	0	0	-	-	-
CO2	Students will be able to Solve simultaneous equations using concepts of Determinants and Matrices	3	1	1	0	0	0	0	0	0	0	-	-	-
CO3	Students will be able to solve simple problems Using concepts of Partial Fractions	1	1	1	0	0	0	0	0	0	0	-	-	-
CO4	Students will be able to Solve simple problems by applying using concepts of trigonometry.	3	2	1	0	0	0	0	0	0	0	-	-	-
CO5	Students will be able to Solve the problem of function using the concept of Function	1	1	0	0	0	0	0	0	0	0	-	-	-
CO6	Students will be able to Solve the problem of function using the concept of Limits	1	3	0	0	0	0	0	0	0	0	-	-	-

14. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Sr. No	Name of the faculty member	Designation and Institute
1	Mr. M.A. Ali	Lecturer in Mathematics, Government Polytechnic Aurangabad
2	Mr. R.B. Borulkar	Lecturer in Mathematics, Government Polytechnic Aurangabad
3	Mrs. H.H. Bhumkar	Lecturer in Mathematics, Government Polytechnic Aurangabad

Member Secretary PBOS Chairman PBOS Co-coordinator science and Humanities

COURSETITLE : ENGINEERING GRAPHICS (EG)

COURSE CODE : 6G201

DIPLOMA PROGRAMME IN WHICH THIS COURSE IS OFFERED	SEMESTER
AE	**First**

1. RATIONALE:

Engineering Drawing is the language of engineers and technicians. Always the engineers come across different types of drawings. It is therefore very important to understand the fundamentals and basic concepts involved in drawing.

It describes the scientific facts, concepts, principles and techniques of drawings in any engineering field to express the ideas, conveying the instructions, which are used to carry out jobs in engineering fields. The course aim for building foundation for the further course in drawing and other allied subjects.

It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards. The curriculum aims at developing the ability to draw and read various drawings, curves and projections.

2. COMPETENCY:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

"Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments."

"Draw orthographic views and isometric views."

3. TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PT	ESE (PR)	PA	100
2	--	2	4	--	--	50@	50	
Exam duration						02 hrs		

Legends: L -Lecture; **T** -Tutorial/Teacher Guided Student Activity; **P** -Practical; **C** - Credit; **ESE**-End Semester Examination; **PA** -Progressive Assessment.

4. COURSE OUTCOMEs (COs):

1. Draw geometrical figures and scales.
2. Drawing of various engineering curves.
3. Draw orthographic views of given component.
4. Draw isometric view of given component.

5. Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.

5. COURSE DETAILS.

Unit	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)**
Unit – I **Introduction**	1 Use drawing equipments and instruments effectively. 2 Draw and prepare simple drawings. 3 Follow and apply standard practice as per bureau of I.S. for planning and layout. 4 Choose appropriate scale factor for the drawing.	1.1 Drawing Instruments and their uses 1.2 Letters and numbers (single stroke vertical) for main title, sub-title and normal use. 1.3 Different types of lines, Convention of lines and their applications. 1.4 Scale (reduced, enlarged & full size), Plain scale and Diagonal scale. 1.5 Sheet sizes and layout, Geometrical Constructions. 1.6 Dimensioning, its methods, parallel and chain dimensioning, radius and diameter dimensioning, leader and its use, dimension with text.
Unit – II **Simple Drawing Practices**	1 Select line types and divide given line, circle into equal number of parts. 2 Draw different regular polygons and circle.	2.1 Drawing of different circles with thin, thick, center line use, dividing circle into number of equal parts, dividing line into equal parts. 2.2 Drawing pentagon, hexagon and rhombus, drawing correct arrows to dimension lines, drawing tangent to circle from given point
Unit – III **Engineering Curves**	1 Draw engineering curves with proficiency and speed as per given dimensions. 2 Draw curves with uniform thickness and darkness, dimensioning as per IS.	3.1 To draw ellipse by – • Arcs of circle method • Concentric circle method • Oblong method 3.2 To draw parabola by – • Directrix focus method • Rectangle method 3.3 To draw hyperbola by – • Transverse axis & focus method. • Passing through a given

		point. (Rectangular hyperbola) 3.4 To draw involute of square, pentagon hexagon and circle. 3.5 To draw cycloid, epicycloid, hypocycloid.
Unit – IV **Orthographic Projections**	1Draw the orthographic views of object. 2 Interpret given orthographic views and imagine the actual shape of the component.	4.1 Converting pictorial view into orthographic views. (pictorial view of components with holes, cylinders, ribs, plates, slots) 4.2 Sectional orthographic projection of simple objects. (Use First angle method of Projection).
Unit – V **Isometric Projections**	1 Draw isometric view of given object. 2 Draw isometric scale.	5.1 Isometric projection of simple objects 5.2 Isometric projection of objects having circular holes, slots on sloping surface.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (End semester examination)

Unit	Unit Title	Teaching Hours	Distribution of practical examination marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	4	2	2	2	6
II	Simple Drawing Practices	4	2	2	2	6
III	Engineering Curves	8	4	4	6	14
IV	Orthographic Projections	8	2	4	8	14
V	Isometric Projections	8	2	4	4	10
	Total	32	12	16	22	50

Legends: R = Remembrance; U = Understanding; A = Application and above levels

7. LIST OF EXERCISES/PRACTICALS.

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/ programme outcomes.
A3 size sketch book should be used by the students. It is necessary to draw all the sheet problems in sketch book first and then redrawn on the sheets

S. No.	Unit Number	Practical Exercises	Hrs. required
1	I	1. Drawing of lines of different types, lettering and numbers. 2. Drawing of plain and diagonal scale. 3. Redraw any 2D drawing with circles, slots and curves. Show dimensions on it. (Drawing on sketchbook.)	2 2 2
2	II	1. Drawing of regular pentagon, hexagon with standard procedure. Measure internal and external angles. 2. Divide line, circle, and angles in equal number of parts. (Drawing on sketchbook.)	2
2	III	Sheet 1: Drawing of engineering curves. (3 problems) each on ellipse, parabola and hyperbola. Sheet 2: Drawing of Engineering curves. (3 problems) each on scale, involute and cycloid.)	4 4
3	IV	Drawing of Orthographic views from given pictorial view. (Minimum 2 objects on sketchbook) Sheet 3: Drawing orthographic views from pictorial view. (2 objects) Use of first angle method only	4 4
4	V	Drawing of Isometric views of simple Objects. (Minimum 2 objects on sketch book). Sheet 4: Drawing of Isometric views of simple objects (any 2 objects).	4 4
		Total	32

Notes:

a: Use one side of sheet.

b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.

c: The dimensions of line, distances, angle, side of polygon, diameter, etc. may be different for different batches.

d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students activities are compulsory to be performed.

e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.

f: For ESE Practical examination, students are to be assessed for competencies

achieved. Students are to be given data for practical ESE to prepare drawings.
g: At the end of term practical examination of 50 marks of 2 Hours duration is compulsory to all students. External and Internal Examiners should set and assess the Question paper jointly as per following guidelines

- Engineering curves and geometric construction (three problems) 24 marks
- Simple Orthographic projection (One Problem) 16 marks
- Isometric projection with slots and holes (One Problem) 10 marks

8. LIST OF STUDENT ACTIVITIES.

Sr. No.	Activities
1	Sketch the combinations of set squares to draw angles in step of 15 degrees. (15^0 , 30^0 , 45^0 , 60^0 , 75^0 , 90^0 , 105^0 , 120^0 , 135^0 , 150^0 , 165^0 , 180^0).
2	List the shapes you are observing around you in real life with place/item. (For ellipse, parabola and hyperbola).
3	Draw free hand isometric and orthographic views of any components
4	Observe and draw the locus/path of a point on circumference of a rolling wheel.
5	Prepare cuttings of circle and polygons using cardboard/drawing sheet.

9. SPECIAL INSTRUCTIONAL STRATEGIES.

Sr. no.	Unit no	Unit name	Strategy
1	I	**Introduction**	Conventional black board method, Use of models. Use of software.
2	II	**Simple Drawing Practices**	Conventional black board method, Use of models.
3	III	**Engineering Curves**	Planes made of sheet, cardboard.
4	IV	**Orthographic Projections**	Models, Use of software.
5	V	**Isometric Projections**	Models and cut section.

10. LEARNING RESOURCES:

Sr. No	Title of Book	Author and Publication
1	Elementary Engineering Drawing	N.D.Bhatt , Charotar Publishing House
2	Engineering Drawing	Mali , Chaudhari, Vrinda Publication
3	Engineering Drawing	Sidheswar Shastri , Tata McGraw Hill
4	Engineering Graphics	Arunodaykumar, Techmax publications, Pune

5	Engineering Drawing for schools and colleges	IS CODE SP- 46

11. LIST OF MAJOR EQUIPMENT/ INSTRUMENT WITH BROAD SPECIFICATIONS

Sr. No.	Major equipment/ Instrument with Broad Specification	Quantity
1	Models- full and cut. (wooden and acrylic)	12
2	Drawing equipments and instruments for class room teaching-large size.	1
3	Drawing board-half imperial size.	100
4	T-square or drafter (Drafting Machine).	1

12. MAJOR EQUIPMENT/ INSTRUMENT WITH BROAD SPECIFICATIONS

Sr. NO.	Name of the Equipment	Specification
1	Various models of standard solids such as pyramid, prism, cone, cylinder etc.	
2.	Different objects or machine elements.	

13. E-LEARNING RECOURSES:

List of Software/Learning Websites.

- http://www.slideshare.net/sahilsahil992/conic-section-1819818
- http://www.technologystudent.com/designpro/drawdex.htm
- http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/
- http://web.iitd.ac.in/~hirani/mel110-part3.pdf
- http://www.studyvilla.com/ed.aspx
- http://www.youtube.com/watch?v=a703_xNeDao
- E-learning package from KOROS.
- E-learning package from Cognifront.

POs and PSOs assignment and its strength of assignment with each CO of the course.

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	No. of hours allocated in curriculum
CO1	Draw geometrical figures and scales.	3	3	2	3	-	-	-	-	3	2	2	2	6
CO2	Drawing of various engineering curves.	3	3	2	3	-	-	-	-	3	2	2	2	8
CO3	Draw orthographic views of given components.	3	3	2	3	-	-	-	-	3	2	2	2	8
CO4	Draw isometric views of given component.	3	3	2	3	-	-	-	-	3	2	2	-	8
CO5	Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.	3	3	2	3	-	-	-	-	3	2	2	-	2

Name and Designation of Course Designer:-

1 Prof. Aher S M

2 Prof. Dhirbassi G D

HOD CDIC coordinator

COURSE TITLE- **BASICS OF COMPUTER SYSTEM**

COURSE CODE **6G203**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
AE	FIRST

1. RATIONALE

This course pertains to basic technology level. It aims to developing fundamentals of Computer and its Applications in students of various programs. This will enable students in using application software's such as word processor, spreadsheets, and power point presentations in their professional fields. Further it will enable students to be lifelong learner.

2. COMPETENCY

"Use of computer and software application proficiently".

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (PR)	PA (TW)	50
-	-	2	2	--	--	25@	25	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal

4. COURSE OUTCOMES

On successful completion of the course, the students will be able to:

1. Connect and operationalize computer system with its peripheral devices.
2. Create and Format documents in Microsoft Word.
3. Create spreadsheets in Microsoft Excel by using formulae.
4. Create and edit basic power point presentations in Microsoft PowerPoint.

5. Use internet for creating email-id, receive and send email with attachment & search information on internet.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit- 1 Basics of Computer System	1a.Describe computer hardware and software 1b.Identify & use of I/O devices 1c. Describe functioning of CU ALU and memory unit 1d Differentiate various types of printers 1e. Explain use of OS 1f. Demonstrate various file handling operations	1.1 Concept of Hardware and Software 1.2 Computer block diagram and its component like CPU, Control Unit, Arithmetic logic Unit (ALU) & Memory Unit 1.3 Input Output Devices: Keyboard, Mouse, Scanner, Monitor, Printers: Dot matrix, Laser, Inkjet, Plotters. 1.4 System software and Application Software 1.5 Operating system concepts, purpose and functions 1.6 Operations of Windows OS. 1.7 Creating and naming of file and folders 1.8 Copying file, renaming and deleting of files and folders, 1.9 Searching files and folders, installation application, creating shortcut of application on the desktop 1.10 Overview of control Panel, Taskbar.
Unit-2 Word Processor	2a. Create, edit and save word document using basic text formatting features, page setup options & print options. 2b.Apply spell check & grammatical check in the created document. 2c. Insert graphics/clipart/ smart art/shapes/charts in the document. 2d. Create tables, insert, delete rows and columns and apply different table properties.	2.1 Overview of Word processor 2.2 Basics of Font type, size, colour 2.3 Effects like Bold, italic , underline, Subscript and superscript, 2.4 Case changing options, 2.5 Inserting, deleting, undo and redo, Copy and Moving (cutting) text within a document, 2.6 Formatting Paragraphs and Lists 2.7 Setting line spacing; single, multiple 2.8 Page settings and margins including header and footer 2.9 Spelling and Grammatical checks 2.10 Table and its options, Inserting rows or columns, merging and splitting cells. 2.11 Insert Picture, Clipart, shapes, smart art & charts.

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
		2.12 Working with pictures, Inserting Pictures from Files, Wrapping it with image. 2.13 Finding & replacing text. 2.14 Using Drawings and WordArt; Lines and Shapes, Modifying Drawn Objects. 2.15 Printing: print preview, select printer & appropriate print options.
Unit- 3 Excel (Spreadsheets)	3a. Create, open, save and print worksheet with page setup and print options. 3b. Enter data and insert, delete and format cells, rows and columns. Use formula and functions 3c. Insert formulas, functions and named ranges in worksheet. 3d. Create chart of different types.	3.1 Introduction to Excel, 3.2 Introduction to data, Cell address, Excel Data Types, Concept of hyperlink 3.3 Introduction to formatting number, text and date. 3.4 Concept of worksheet and workbook. 3.5 Understanding formulas, Operators in Excel, Operators Precedence, Understanding Functions, Common Excel Functions such as sum, average, min, max, date, sqrt, power, upper, lower, count, countif, roundup, sin, cos. 3.6 Introduction to charts, overview of different types of charts available with Excel. 3.7 Hide, unhide rows and columns. 3.8 Concept of print area, margins, header, footer and other page setup options.
Unit- 4 Power Point Presentation	4a. Create a simple text slide using formatting, selecting a slide layout and insert pictures & backgrounds. 4b.Use different design templates for creating slides. 4c. Apply slide transitions and slide timings and animation effect for slide show. 4d. Insert hyperlink in the created slides.	4.1 Outline of an effective presentations 4.2 Starting a New Presentation Files, Saving work, 4.3 Creating new Slides, Working with textboxes. 4.4 Changing a slides Layout, Applying a theme, Changing Colours, fonts and effects, Creating and managing custom Colour & font theme, Changing the background. 4.5 Use of design template and auto content wizard. 4.6 Apply animation and transition to slides with timing effect. 4.7 Slideshow: from beginning slideshow, from current slideshow, custom slideshow.

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
		4.8 Creating hyperlinks**,** Using action buttons
Unit- 5 Introduction to Internet	5a. Know different terms related to internet and browsers. 5b. Understand need & duty of ISP & List out different ISP in city. 5c. Use internet for searching information and create, receive & send email with attachment.	5.1 What is the Internet? 5.2 Web pages, Home Pages. 5.3 Use of web sites 5.4 ISP: need & duties of ISP, different ISP in city 5.5 Browsers 5.6 Universal resource locators (URL) 5.7 Browsing or surfing the web 5.8 Search engines 5.9 E-mail and Creation of E-mail ID. Sending & Receiving email with attachment. 5.10 Chatting & Video Conferencing tools: Skype and GTalk 5.11 Applications of the Internet

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Practical Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Basics of Computer System	08				NA
2	Word Processing	08				NA
3	Spreadsheet	06				NA
4	Presentation	06				NA
5	Introduction to Internet	04				NA
6						NA

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Connect the peripherals to a computer system. Get the information about the manufacturers and prices of various components of a PC and laptop.	2
2	1	Start and shutdown of windows, starting different applications. Use of accessories like calculator, paint, notepad & WordPad, Use of system tools like Disk Cleaner, Disk defragmenter, System Information, System Restore & Control panel.	4
3	1	Perform file management operations such as copying, deleting, renaming, creating folders, renaming folders using My computer, Windows Explorer, searching files and folders.	2
4	1	Change windows format such as wall paper, date &time, installing printer, installing and removing programs by using add/remove programs.	2
5	2	Prepare a sample doc files such as resume, application, time table etc. using all word processor tools from menu bar.	6
6	3	Prepare sample spreadsheets such as sample result sheet, salary sheet of employees using all MS-Excel tools from menu bar. (applying excel formulae/functions)	6
7	4	Prepare sample power point presentation by applying MS-Power Point tools such as design template, background, transition and animation effect to slides.	6
8	5	Search information on internet .Use Internet to create email account, send email with attachment, receive email and management of email account.	2
9	5	Use of E-commerce sites, Mobile apps for various online transactions.	2
			32

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like: assignments based on MS-Office, teacher guided self learning activities and lab based mini-projects on MS-Word, MS-Excel and MS-PowerPoint. These could be individual or group-based.

a. Visit institute website.
b. Manage files and folder using Windows.
c. Prepare letter and project report using word processor
d. Create result sheet by inserting student marks and show it in chart form on the same worksheet using Excel spreadsheet.
e. Develop effective presentation of project report using PowerPoint Presentation.
f. Use open source software like openoffice.org (latest version).

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Group based.
b. Q & A technique.
c. Individual based.
d. Activity based learning
e. Self Line learning.

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Fundamentals of computers	P.K.Sinha	BPB Publication
2.	Computer course	R.Taxali	TMGH Publication
3.	MS-Office for Dummies	Wallace Wang	Wiley India, New Delhi
4.	Basic Computer Engineering	Dr. Shailendra Singh, Pawan Thakur, Anurag Jain	Satya Prakashan, New Delhi, India.
5.	Microsoft Office	Ron Mansfield	BPB Publication
6.	Fundamentals of computers	P.K.Sinha	BPB Publication

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :

S. No.	Name of equipment	Brief specification
1.	Computer System with latest configuration along with Windows Operating System and latest MS-Office.	Desktop Computer/Personal Computer (Windows OS Prof. Edition/Academic edition) with preloaded operating systems windows 7/windows 8 (academic Lic)
2.	PROJECTOR	Multimedia Projector with wireless connectivity between PC and Projector
3.	PRINTER	HP 1022n laser printer
4.	SCANNER	HP scanner ,Color Scan Method: Color, Flatbed, Mirror Moving Scanner Optical Resolution: 800 x 1600 dpi Maximum Scanning Area 304.8 x 431.8 mm (12x17 inch)
5.	Computer System with latest configuration along with Windows Operating System and latest MS-Office.	Desktop Computer/Personal Computer (Windows OS Prof. Edition/Academic edition) with preloaded operating systems windows 7/windows 8 (academic Lic)
6.	PROJECTOR	Multimedia Projector with wireless connectivity between PC and Projector

12. LEARNING WEBSITE & SOFTWARE

(Please mention complete URL of the E- resource CO wise)

a. https://www.youtube.com/watch?v=cXBVMyKQ3ZY
b. http://www.gcflearnfree.org/computerbasics/
c. http://www.homeandlearn.co.uk/word2007_2010/Word-2007-2010.html
d. http://www.homeandlearn.co.uk/excel2007/Excel2007.html
e. https://support.office.com/

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

SNo	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Connect and operationalize computer system with its peripheral devices.	2	2	2	0	0	0	0	0	0	2	0	0
2	Create and Format documents in Microsoft Word.	3	0	3	3	0	0	0	0	0	3	0	0
3	Create spreadsheets in Microsoft Excel by using formulae.	3	0	3	3	0	0	0	0	0	3	0	0
4	Create and edit basic power point presentations in Microsoft PowerPoint.	3	0	3	3	0	0	0	0	0	3	0	0
5	Use internet for creating email-id, receive and send email with attachment & search information on internet.	1	1	1	1	0	0	0	0	0	1	0	0

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	R.T.Aghao	Sr.Lecturer in APM Dept. , Govt. Polytechnic, Aurangabad
2	O.R.Varma	Lecturer in IT Dept., Govt. Polytechnic,Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE: ENVIRONMENTAL SCIENCE

COURSE CODE: 6G304

DIPLOMA PROGRAMME IN WHICH THIS COURSE IS OFFERED	SEMESTER
AE	FIRST

1 RATIONALE:-

The present plight of the world as a victim to a number of environmental setbacks ranging from global warming, ozone layer depletion, acid rains led to alarmingly increase in world pollution levels. This has led to the dangerous situation threatening existence of biosphere on the earth. Diploma engineers also get confronted with this issue in their professional life.. Diploma engineers need to be aware of environment and associated issues so that he can help in protection and preservation of environment.

2 COMPETENCY: -

"Contribute in overall preservation of eco system of organization."

3 TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PT	ESE (PR)	PA	50
0	--	2	2	--	--		50	
Exam duration			--	--	--	--	--	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Test; OR-Oral examination

4 COURSE OUTCOMES:-

At the end of this course, students would be able to -

1. Identify elements of biodiversity.
2. Assess the impact of biodiversity
3. Apply provisions of various environmental protection acts in practice.
4. Undertake survey on environmental concerns and remedial measures

5 COURSE DETAILS:-

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Environment and studies**	1a. Write genesis of environmental concerns 1b. Identify the various types of environmental issues.	1.1 Definition , Scope and importance of Environmental studies 1.2 Meaning of environment, , Environment and its components, Segments of environment, scientific aspects 1.3 Global environment crisis and factors affecting it. Deforestation. aquatic life and tsunami effects ,Population, Carbon dioxide emissions, pollution, Extinction of species etc. Ecological Foot print
Unit– II **Environmental** **Natural Resources**	2a. Classify different resources 2b. Outline issues associated with different resources. 2c. Develop strategies to conserve of natural resources.	2.1. Renewable and Nonrenewable natural resources and associated issues as under, a. Forest resources b. Water resources c. Energy resources d. Land resources e. Food resources f. Energy resources 2.2. Role of individual in conservation of natural resources
Unit– III **Ecosystems**	3a. Outline ecosystem. 3b. Categorize various ecosystems .	3.1 Concept of Ecosystem 3.2 Structure and function of ecosystem 3.3 Structure and functions of following ecosystems, a. Forest Ecosystem b. Grassland Ecosystem

		c. Desert Ecosystem d. Aquatic ecosystem
Unit– IV **Biodiversity and Conservation**	4a. Outline Biographical classification of India 4b. Assess Biodiversity loss and its impact.	4.1 Introduction, Values of the Biodiversity, Biographical classification of India 4.2 Biodiversity loss and its impact 4.3 Conservation of Biodiversity, Efforts made in India.
Unit - V **Environmental Pollution**	5a. Describe pollution and its typs 5b. Describe cause, effect relationship. 5c. Conduct Survey on Environmental Pollution	5.1 Definition of pollution and its types 5.2 Causes, effects and control measures of following types of pollutions a. Air Pollution b. Water Pollution c. Soil Pollution d. Marine Pollution e. Thermal Pollution f. Nuclear hazards and pollution 5.3 Pollution norms, rules and bye laws 5.4 Solid waste management: Causes, Effects and control measures of urban and industrial waste.
Unit – VI **Social Issues and Environment**	6a. Identify social issues related to environment 6b. Suggest control measures to counter the issues, .	6.1 Urban problems related to Energy, Measures of water conservation including Rain water harvesting, Watershed Management 6.2 Climatic changes, Global Warming, Acid rain, Ozone layer depletion issue, Nuclear accidents and holocaust. Kyoto Protocol, Climate justice 6.3 Introduction to Environment (protection) act(prevention and control of pollution),Wildlife protection act, Forest protection act Air (Prevention and control of pollution) Act, Water related Environment laws ,issues in

		enforcement of environmental legislation, public awareness.
Unit – VII **Human population and environment**	7a. Use of ICT in environment and human health areas.	7.1Concepts of Population Growth, Environment and human health, Role of information technology in environment and human health

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of practical examination marks			
			R Level	U Level	A Level	Total Marks
I	Environment and studies	6	NA	NA	NA	NA
II	Environmental Natural resources	6	NA	NA	NA	NA
III	Ecosystems	6	NA	NA	NA	NA
IV	Biodiversity and conservation	6	NA	NA	NA	NA
V	Environmental Pollution	12	NA	NA	NA	NA
VI	Social issues and environment	6	NA	NA	NA	NA
VII	Human population and environment	6	NA	NA	NA	NA
Total		48	NA	NA	NA	NA

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Here all the practical exercises are to be completed by students in a group. The group size should be 10 to 12. The groups should be formed by concerned teacher in consultation with students Every group should be assigned a group leader. All groups will complete the practical assignments in spare time and during Sundays and holidays. No separate time slots will be allotted to these practical exercises. Teacher will guide and give necessary inputs for modus operand of exercises.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Prepare report on environmental issues of your institute / Selected Premises	04
2	II	Collect information related to natural resources of India and methods adopted for conservation of these resources	02
3	I, II	Prepare "Energy Audit Report" of a small home. And give suggestions for conservation of energy.	02
4	III, IV	Examine water usage of a small community/locality in city/Apartment /Your Institute and prepare a Report on actions that could be taken to conserve the water fron following point of view: How much water is consumed How much wastage of water occurs How can demand of water be reduced How can ecological footprint of water they get can be reduced What other environment friendly ways of getting water can one implement What is the quality of water and how can it be improved How reuse and recycling of water can be done How users can be educated for proper use of water	02
5	I,II,III, VI	Visit, "Roof water harvesting" system installed in nearby area and prepare a detailed report. Include local bodies legislation as regards roof water harvesting	02
6	I,II,III	Undertake "Tree plantation project" and plant at least 03 trees per student in your Institute. Prepare detailed report on tree plantation.	02
7	I,II,III	Visit ,study and analyze a "Solar systems" installed in nearby area and prepare a detailed report. Include following types of systems, a.Household Solar water heating systems b. Solar P-V Systems c.Solar roof top Net metering systems	02
8	IV	Preparation of Biodiversity Report: Select a small park or garden in your area.Prepare a Biodiversity register: list all the species found in place ,find their scientific names with the help of a botanist. Interview long term users of the place and find out about loss of	03

		biodiversity. Write a report describing your observations and your recommendations for conservation of biodiversity.	
9	V	Prepare a report on water pollution scenario in your institute and make a detailed report. Following activities can be undertaken with permission, Locating and studying water consumption locations in institute like Water coolers , R.O units, Filters, taps. Taking and checking drinking water samples periodically from testing authorities and keeping records. Preparing and executing schedule for cleaning water tanks, water filters, RO units etc.	06
10	V	Prepare report Vehicular pollution checking in your institute: Here sample check the two wheelers, four wheeler vehicles of employees, students with the help of Exhaust gas analyzer / Smokemeter periodically and check the levels of pollution.	02
11	V	Prepare report of Noise and Air pollution levels at a crowded square of city using Deciblemeter and Air sampling device	02
12	VI	Collect information on Global Warming,Acid rain, Ozone layer depletion issue,Nuclear accidents and holocaust. Kyoto Protocol, Climate justice, Environment protection laws and regulations.	02
Total			32

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1 Search different journals on Environment
2 Collect info of Environmental laws and regulations from websites.
3 Collect various news paper cuttings on the issues of environment
4 Observe and celebrate following important days on environment,
- 22 April- Earth Day
- 1 – 7 July – Vanamahotsava Week
- 11 International Mountain day
- 2 February –Worlds wetland day
- 5 April – National Maritime day
- 8 June – World Oceans day
- 22 May – international Day of Biological diversity
- 22 March – World Water day.
- 21 March – World Forestry Day
- 16 October –Worlds food day
- 22 September –Car free day
- 29 October-National disaster reduction day
- 21 July – Worlds Population day
- 8 March – Womans day

5 Prepare charts, banners, posters on environment and its protection and display in class, notice boards.
6 Participate in social campaigns concerning environment and its preservation.
7

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATEGIES

1. Q & A Techniques.
2. Field Visits
3. Expert Lectures.

10. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Environmental Studies	R.Rajgopalan	OXFORD university press
2	Environmental Studies	Anindata Basak	Pearson education
3	Air Pollution	M.N. Rao	Tata Macgrawhill
4	Elements of Environmental Science and Engineering	P. Meenakshi	Prentice Hall
5	Introduction to Environmental Engineering	P.AarneVesilind and Susan Morgan	Thomson

11. Major Equipment/ Instrument with Broad Specifications

Sr. No.	Major equipment/ Instrument with Broad Specification	Quantity
1	Biological Microscope	01
2	Air sample testing setup	01
3	Water sample testing setup	01
4	Exhaust gas Analyzer	01
5	Smoke meter	01
6	PC with Net connectivity	01
7	LCD Projector	01 et

12.. E-learning resources

(Please mention complete URL of the E- recourse CO wise)

1. www.unep.org
2. www.ipcc.ch
3. www.grida.no
4. www.wildlifeinindia.com

5. www.fsi.nic.in/sfr_2009.htm
6. www.unesco.org
7. www.chilika.com
8. www.foodfirst.org/media/opeds/2000/4-greenrev.html
9. www.cites.org
10. http://projecttiger.nic.in/
11. www.iwmi.cgiar.org/
12. www.worldwater.org
13. www.indiaenergyportal.org
14. http://www.lifeaftertheoilcrash.net/
15. www.mmpindia.org/
16. www.pcri.com
17. http://www.unwater.org/statistics_pollu.html

List of Films

1. The 11th hour
2. The many faces of madness
3. Planet Earth-BBC documentary
4. The childrens of Amazon
5. The Blue Planet-BBC documentary
6. End of Line
7. The State of planet – BBC Documentary
8. The truth about Tigers
9. Bringing home rain- A film by SushamaVeerappa.
10. Drinking the sky – BBC documentary
11. A Crude Awakening :The OIL Crash – A documentary by Basil Gelpke
12. Poison on a platter – Documentary by Mahesh Bhatt
13. The story of bottled water – A documentary by Annie Leonard on packaged water industry.(Download from www.storyofstuff.org)

13. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	Analyze and assess the impact of biodiversity and its loss on environment.	2				2	2						
CO2	Identify causes of pollution in working system and apply control					2	2						

	measures for prevention.												
CO3	Apply provisions of various environmental protection acts in practice.	2				3	3			3			
CO4	Appreciate correlation between Human population and its effect on environment.	2				2	2			3			
CO5	Read, analyze and apply various laws and regulations concerning environmental issues.	2				3	3						

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	Prof.S.P.Shiralkar	Lecturer in Mechanical Engineering Department
2	Prof. A.B. Deshpande	Lecturer in Mechanical Engineering Department

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- WORKSHOP PRACTICE

COURSE CODE:-6G202

Diploma Programme in which this course is offered	Semester in which offered
AE	First

1. RATIONALE

Workshop Practice is a basic engineering course. Diploma Engineers while working at worksites / in industries, supervises various skilled man power during industrial / site related process. He is required to be conversant with various skills. These basic skills are imparted in basic shops like wood working, fitting, welding, plumbing and sheet metal shop is essential for technician to perform his/her duties in industries. Students are able to perform various operations using hand tool equipment and machineries in various shops. Working in workshop develops the attitude of group working and safety awareness. This course provides industrial environment in the educational institute.

2. COMPETENCY

"Prepare simple jobs on the shop floor of the engineering workshop."

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
	T	P	C	ESE	PT	ESE (OR)	PA	
	--	03	03	--	--	--	50	50

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal

4. COURSE OUTCOMES-

At the end of this course, students would be able to –

1. Select tools and machinery according to job.
2. Use hand tools in different shops for performing different operation.
3. Operate equipment and machinery in different shops.
4. Prepare job according to drawing.
5. Maintain workshop related tools, equipment and machineries

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **General Workshop Practice**	1a. Follow safety practices 1b. Explain the procedure for extinguishing fire 1c. Use firefighting equipment 1d. Locate various machines and equipment in workshop 1e. Follow good housekeeping.	1.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. 1.2 First Aid 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire Classification of fire, Class A, B,C, D, Firefighting equipment, fire extinguishers, and their types . 1.4 Workshop Layout 1.5 Issue and return system of tools, equipment and consumables
Unit– II **Fitting**	2a. Identify fitting tools. 2b. Explain operation of fitting shop machines 2c. Use hand tools 2d. Operate machineries. 2e. Perform fitting operations 2f. Maintain tools, equipment and machineries.	2.1 Fitting hand tools bench vice, hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block , steel rule, twist drills, reamers, tap set, die set and their Specifications 2.2 Operation of fitting shops machineries - Drilling machine, Power saw, grinder their specifications and maintenance. 2.3 Basic process chipping, filling, scraping, grinding, marking, sawing, drilling, tapping, dieing, reaming etc.

Unit– III **Plumbing**	3a. Identify plumbing tools. 3b. Explain operation of fitting shop machines 3c. Use hand tools 3d. Operate machineries. 3e. Perform plumbing operations 3f. Maintain tools, equipment and machineries.	3.1 Plumbing hand tools pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications 3.2 Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications 3.3 Operation of Machineries in plumbing shops- pipe bending machine their specifications and maintenance. 3.4 Basic process cutting, threading.
Unit– IV **Metal Joining**	4a. Identify metal joining tools. 4b. Explain gas and arc welding procedure 4c. Use hand tools. 4d. Perform welding, soldering, brazing operations 4e. Maintain tools, equipment and machineries.	4.1 Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter and their Specifications 4.2 Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthling clamp, wire brush and their Specifications 4.3 Operation of machineries in welding shops- arc welding transformer their specifications and maintenance. 4.4 Welding Electrode, filler rod, fluxes, and solders. 4.5 Basic process welding, brazing and soldering.
Unit– V **Furniture Making**	5a. Select wood working tools as per job/ requirement. 5b. Explain operation of wood working machines 5c. Use hand tools 5d. Operate machineries. 5e. Perform wood working operations 5f. Maintain tools, equipment and machineries.	5.1 Types of artificial woods such as plywood, block board, hardboard, laminated boards, Veneer, fiber Boards and their applications. 5.2 Wood working hand tools carpentry vice, marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares, and their specifications 5.3 Operation of wood working machineries - Wood turning lathe, circular saw, their specifications and maintenance. 5.4 Basic process- marking, sawing, planning, chiseling, turning, grooving, boring.

Unit–VI **Sheet Metal**	6a. Identify sheet metal tools. 6b. Explain operation of sheet metal machineries. 6c. Use hand tools 6d. Operate sheet metal machineries. 6e. Perform bending operations 6f. Maintain tools, equipment and machineries.	6.1 Sheet metal hand tools snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set and their Specifications 6.2 Operation of machineries in sheet metal shops- sheet cutting and bending machine their specifications and maintenance. 6.3 Basic process-marking, bending, folding, edging, seaming, staking, riveting.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (Practical)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	General Workshop Practice	03	01	01	03	05
II	Fitting	12	-	03	06	09
III	Plumbing	06	-	02	07	09
IV	Metal Joining	09	01	02	06	09
V	Furniture Making	09	-	02	07	09
VI	Sheet Metal	09	-	02	07	09
	Total	48	02	12	36	50

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required

1	I	Perform mock drill session in group of minimum 10 students for extinguishing fire.	03
2	II	Prepare job involving marking, punching, sawing, chamfering, drilling, tapping operations as per given drawing. (simple job individually)	09
3	III	Prepare plumbing job as per given drawing (individually)	06
4	III	Prepare black smithy job involving cutting, bending, drawing/ upsetting operations as per drawing (individually)	06
5	IV	Prepare lap joint/butt joint using arc welding as per given drawing (individually)	06
6	IV & V	Prepare utility job/ different working joints involving wood work as per given drawing (in group of 4 to 5 students)	12
7	VI	Prepare sheet cutting, bending, edging, end curling, lancing, soldering and riveting operations. (in group of 4 to 5 students)	06
Total			48

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1. Prepare work diary based on practical performed in workshop. Work diary consist of job drawing, operations to be perform, required raw materials, tools, equipments, date of performance with teacher signature.
2. Prepare journals consist of free hand sketches of tools and equipments in each shop, detail specification and precautions to be observed while using tools and equipment.
3. Prepare/Download a specifications of followings:
    a) Various tools and equipment in various shops.
    b) Precision equipment in workshop
    c) Various machineries in workshop
4. Undertake a market survey of local dealers for procurement of workshop tools, equipment machineries and raw material.
5. Visit any fabrication/wood working/sheet metal workshop and prepare a report.

9. **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

1. Demonstration

10. **SUGGESTED LEARNING RESOURCES**

S. No.	Title of Book	Author	Publication
1.	Workshop Practice	Bawa, H.S.	McGraw Hill Education,Noida; ISBN-10: 0070671192 ISBN-13: 978-0070671195
2.	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta, J.K.;Khurmi,R.S.	S.Chandand Co. New DelhiISBN:81-219-3092-8
3.	Workshop Practice Manual For Engineering Diploma & ITI Students	Hegde, R.K.	Sapna Book House, 2012, ISBN:13: 9798128005830
4.	Introduction to Basic Manufacturing Process & Workshop Technology	Singh, Rajender	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7

11. **Major Equipment/ Instrument with Broad Specifications**

S. No.	Equipment Name with Broad Specifications	Experiment S.No.
1	Fire buckets with stand of medium size	I, II, III, IV,V, VI
2	Fire extinguisher A,B and C types	I, II, III, IV,V, VI
3	Wood Turning Lathe Machine, Height of Centre: 200mm, Distance between Centers: 1200mm, Spindle Bore: 20mm with Taper, Range of Speeds: 425 to 2800 with suitable Motor Drive. with all accessories	II
4	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size -350 x 450 mm, Table Tilting - 45^0	II
5	Wood working tools- marking and measuring tools, saws, claw hammer,	II

	mallet, chisels, plans, squares,	
6	Carpentry Vice 200 mm	II
7	Work Benches- size:1800 x 900 x 750 mm	III
8	Bench Drilling machine (up to 13 mm drill cap.) with ½ H.P. Motor 1000 mm. Height.	III
9	Power Saw machine 350 mm mechanical with 1 HP Motor & all Accessories.	III
10	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with ½ HP/1HP Motor.	III
11	Vernier height Gauge 450 mm	III
12	Surface Plate 600 x 900 mm Grade I	III
13	Angle Plate 450 x 450 mm	III
14	Welding machine 20 KVA 400A welding current 300A at 50, 100, 200, 250, 300 with std. Accessories and Welding Cable 400 amp. ISI with holder	IV
15	Oxygen and acetylene gas welding and cutting kit with cylinders and regulators.	IV
16	Pipe Bending Machine	IV
17	Pipe Vice – 100 mm	IV
18	Pipe Cutter- 50 mm	IV
19	Bench Vice 100 mm	II,III,IV,V,VI
20	Portable Hammer Drill Machine 0-13 mm A.C. 230 V, 2.5Amp, Pistol type, having different types of bits	II, III, IV,V, VI
21	Sheet Bending Machine	VI
22	Sheet Cutting Machine	VI
23	Brazing Equipment	VI
24	Fitting tools - hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block, steel rule, twist drills,	III

	reamers, tap set, die set.	
25	Plumbing tools-pipe vice, pipe bending equipment, pipe wrenches dies.	IV
26	Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter	V
27	Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush.	V
28	Sheet metal hand tools-snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set	VI

12. E-learning recourses

(Please mention complete URL of the E- recourse CO wise)

1. http://www.asnu.com.au
2. http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf
3. http://www.weldingtechnology.org
4. http://www.newagepublishers.com/samplechapter/001469.pdf
5. http://www.youtube.com/watch?v=TeBX6cKKHWY
6. http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related
7. http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu
8. http://www.piehtoolco.com
9. http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/
10. https://www.youtube.com/watch?v=9_cnkaAbtCM

13. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CO 1	Prepare simple jobs on the shop floor of the engineering workshop	1	2	3	3	1	-	1	2	2	2		3
CO 2	Select tools and machinery according to job	1	2	3	3	1	-	1	2	2	2	2	
CO 3	Use hand tools in different shop for performing different operation.	1	2	3	3	1	-	1	2	2	2		3
CO 4	Operate equipment and machinery in different shops	1	2	3	3	1	-	1	2	2	2	3	3
CO 5	Prepare job according to drawing	1	2	3	3	1	-	1	2	2	2		
CO 6	Maintain workshop related tools, equipment and machineries	1	2	3	3	1	-	1	2	2	2	3	

Sr No	Name of the faculty members	Designation and Institute
1	D.V.Tammewar	Workshop Superitendent
2	Dr.U.V.Pise	Head of Mechanical Engineering

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE : COMMUNICATION SKILLS
COURSE CODE : 6G302

Diploma Programme in which this course is offered	Semester in which offered
AE	Second

1. RATIONALE

Proficiency in communication skills is one of the prime needs of diploma engineer/ technician who has to communicate all the time with peers, superiors, sub-ordinates and clients in his professional life. The need of acquiring effective communication skills is more essential. As the world is shrinking into a global village with the new technologies, technically sound diploma holders may be a quality human resource, if their communicative abilities are shaped properly. Therefore, this course is designed to develop the ability of students to stand as a skilled and effective communicator with employability skills.

2. COMPETENCY

At the end of studying this course students will be able to

"Communicate effectively at workplaces."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PT**	**ESE(OR)**	PA	TOTAL MARKS
1	0	2	3	-	-	25	50*	75
Exam Duration				-	-	-	-	

(*): *Out of 50 marks, 10 marks -micro-project assessment; 40 marks-progressive assessments*

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Test; OR-Oral examination

4. COURSE OUTCOMES

1. Express new ideas effectively.
2. Select suitable type of communication in different situations.
3. Avoid communication barriers for effective communication.
4. Use appropriate body language to communicate effectively.
5. Formulate various ways to face interview effectively.
6. Draft different types of business letters, notices, memoranda and E-mails using correct formats.

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT-I Introduction to communication	1a. Describe significance of Communication. 1b. Describe the elements of communication. 1c. Explain the cycle & process of communication. 1d. Identify the various communication situations.	1.1. Definition, importance 1.2. Communication cycle / process 1.3. Elements of Communication
UNIT-II Types of communication	2a.Identify the types of communication. 2b.Explain the types of communication.	2.1. Verbal-nonverbal , formal-informal, upward-downward, horizontal-diagonal communication
UNIT -III Principles of effective communication	3a.Explain the principles of communication. 3b.Illustrate principles of effective communication. 3c. Describe communication barriers. 3d. Identify the types of communication barriers. 3e. Select ways to overcome communication barriers.	3.1.Effective Communication 3.2.Barriers to communication & ways to overcome them
UNIT-IV Non -Verbal Communication	4a. Understanding non-verbal communication. 4b. Know the uses of body language. 4c. Uses of pictorial representations.	4.1.Non-verbal codes 4.2.Aspects of body language 4.3. Pictorial representation
UNIT –V Interview Techniques	5a. Listening& comprehending the passage. 5b. Having presence of mind. 5c. Managing stress. 5d. Facing viva.	5.1.Listening skills 5.2.Stress management 5.3.facing oral communication
UNIT-VI Formal Written Skills	6a. Correct format with correct language. 6b. Identify the types of letters. 6c.Applying different techniques of drafting letters.	6.1.Business Letters: Enquiry, Order, Complaint, Adjustment, Seeking Permission etc.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Communication	03	NA	NA	NA	NA
II	Types of communication	02	NA	NA	NA	NA
III	Principles of Effective Communication	03	NA	NA	NA	NA
IV	Non-verbal communication	03	NA	NA	NA	NA
V	Interview Techniques	02	NA	NA	NA	NA
VI	Formal written skills	03	NA	NA	NA	NA
	Total	16	NA	NA	NA	NA

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psycho-motor and affective domain)** so that students are able to acquire the competencies.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I & II	Identify the elements of communication cycle with three Suitable examples.	04
2	II	Deliver two short and long prepared speeches.	04
3	III	Present a role-play.	04
4	III	Form a group of four students and make a group discussion on current issues and summarize it.	04
5	II&IV	Prepare a power point presentation on any one technical topic.	04
6	III	Demonstrate any assigned activity using appropriate body language.	04
7	III	Face a mock-interview.	04
8	IV	Write two formal letters in correct format.	04
Total			**32**

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities:

a. List the different communication situations.
b. Use audio visual aids to learn different skills in communication.
c. Conversations –formal/informal.
d. Read newspaper.
e. Collect different audio clips.
f. SWOT analysis.
g. Deliver welcome/farewell speeches in various programmes.
h. Use of graphics in technical writings.
i. Interviewing common people.
j. Debating practices.
k. Summarizing discussions.
l. Practicing interviews

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

a. Arrange various debate/elocution competitions to develop spoken communication skills.
b. Show audio/video clips to develop listening skills.
c. Collect various pictures/charts to demonstrate body language.
d. Prepare and give oral presentations.
e. Guide micro-projects in groups as well as individually.

10. SUGGESTED TITLES OF MICRO PROJECTS

A micro-project is planned to be undertaken by a student. He/she ought to submit it by the end of the semester to develop the industry oriented COs. The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty**:**

a. Find out five communication events from day to day life and explain them in the form of communication process.
b. Find out various reasons of communication gap in certain official situations.
c. Identify various types of communication situations in student's life.
d. Study various barriers occurring in communication among diploma students.
e. Find out the remedies to overcome psychological barriers in communication.
f. Collect different types of letters and analyze the language and format used in it.
g. Prepare a review on the listened story/news/discussion/meeting.

11. SUGGESTED LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1.	Business Communication	R.C.Bhatiya	Ane Books India, New Delhi.
2.	Developing Communication Skills	Krishna Mohan& Meera Banerjee	Macmillan
3.	Power Point Presentation	Adam B Cooper	Macmillan
4.	Group Discussions & Interviews	Dr.B.R.Kishor& D. S.Paul	Vee Kumar
5.	Body Language	Allan Pease	Sheldon Press, London.

12. Major Equipment/ Instrument with Broad Specifications

Sr.No.	Name of the Equipment	Specification
1	Digital English Language Laboratory	
2	Computers and Headphones	
3	Magazines,Articles,Journals in Lab.	

13. E-learning resources

(Please mention complete URL of the E- resourses CO wise)

1	https://www.nptel.ac.in/courses
2	https://www.k12reader.com
3.	https://www.eduaction.com
4.	https://www.k5learning.com
5.	https://www.english4u.com

POs and PSOs assignment and its strength of assignment with each CO of the Course -

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	Develop the habit to express new ideas properly.	1	1	3	-	1	-	-	-	1	1	-	-	-
CO2	Select correct type of communication in different situations.	-	-	1	-	1	-	1	1	1	1	-	-	-
CO3	Avoid communication barriers for effective communication.	-	-	2	-	2	2	2	2	2	2	-	-	-
CO4	Use appropriate body language to communicate effectively	-	-	1	-	2	2	2	3	3	3	-	-	-

CO5	Formulate various ways to face interview effectively.	-	-	2	-	3	2	2	3	3	3	-	-	-
CO6	Draft different types of business letters, notices, memoranda and E-mails using correct formats.	-	-	1	-	1	-	-	1	1	1	-	-	-

Sr. No	Name of the faculty member	Designation and Institute
1	Mrs. P.Y. Kamble	Lecturer in English, Government Polytechnic, Aurangabad
2	Mrs. M.S. Ban	Lecturer in English, Government Polytechnic, Aurangabad
3	Mr. P.V. Deshmukh	Lecturer in English, Government Polytechnic, Aurangabad
4	Mr. R.L. Korde	Lecturer in English, Government Polytechnic, Aurangabad
5	Mr. D.D. Gangthade	Lecturer in English, Government Polytechnic, Aurangabad
6	Mr. A.P. Jagtap	Lecturer in English, Government Polytechnic, Osmanabad

Member Secretary PBOS Chairman PBOS Co-coordinator
science and Humanities

COURSE TITLE **ENGINEERING PHYSICS**
COURSE CODE **6G103**

Diploma Programmes in which this course is offered	Semester in which offered
AE	Second

1. RATIONALE

Engineering Physics represents foundation level of courses. It is considered as the mother of all engineering programmes. The principles, laws, hypothesis, concepts, ideas which are acquired by students through this course help in reinforcing the knowledge of technology and solving engineering problems.

2. COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies…

I. Apply facts, concepts and principles of Physics for solving various Engineering Problems
II. Observe, describe, interpret and interact with physical and engineering world through concepts and principles of physics.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			**Total Credits (L+T+P)**	**Examination Scheme**				
				Theory Marks		**Practical Marks**		**Total Marks**
L	T	P	C	ESE	PT	ESE	PA	**150**
3	0	2	5	80~	20~	25@	25	
Exam Duration				2 Hrs.	1 Hr.	2 Hrs.		

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical;
C – credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment;
PT- Progressive Test**; ~** - Multiple choice Online Examination
@ Internal Examination

4. COURSE OUTCOMES:

Students will able to

1. Determine relevant physical properties of a given material.
2. Analyze thermal, optical and acoustical system using properties of heat, light and sound.
3. Apply fundamentals electrical laws.
4. Select different type of semiconductors, x-ray and optical fibre application.

5. COURSE DETAILS:-

Unit	Major Learning Outcomes	Topics and Sub-topics
UNIT-I Genral Propertis of Matter	1a. Measure Strength parameter. 1b. Measure automization and lubricity of given liquid.	**Elasticity:** 1.1 Definitions of deforming force, restoring force, elasticity, plasticity, Factors affecting elasticity.· 1.2 Stress Tensile, Compressive, Volumetric and Shear stress, Strain: Tensile, Volumetric and Shear strain. 1.3 Elastic limit, Hooke's law. Elastic co-efficient- Young's modulus, bulk modulus, modulus of rigidity and relation between them **Viscosity** 1.4 Viscous force, definition of viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its SI unit. 1.5 Streamline and turbulent flow with examples, critical velocity, Reynold's number and its significance. **Surface tension** 1.6 Cohesive and adhesive force, Laplace's molecular theory of surface tension, Surface Tension: definition and unit, 1.7 effect of temperature and impurity on surface tension. Angle of contact, Capillarity and examples of capillary action 1.8 derivation of expression for surface tension by capillary rise method, applications of surface tension.

UNIT-II Heat Light And Sound	2a. Analyze thermal system. 2b. Analyze optical system. 2c. Analyze acoustic system.	**Heat** : 2.1 Three modes of transistor of heat , conduction convection Radiation , law of thermal conductivity 2.2 Coefficient of thermal conductivity , , expansion of solid and coefficient of linear , aerial and cubical expansion & relation between them **LIGHT** : 2.3 Introduction to reflection and refraction of light, Snell's Law, 2.4 Dispersion. Total internal reflection of light. Critical angle, Simple problems. **Properties of sound** : 2.5 Wave motion transverse & longitudinal wave 2.6 Free & forced vibration , Resonance formula calculate velocity of sound by resonance tube method
UNIT-III Electrostatics And Current Electricity	3a.Analyze electrical system.	3.1 Electric charge, Coulomb's Law of Charges, Unit charge, field, intensity of electric field, electric lines of forces (Properties) Electric Flux, Flux Density. 3.2 Concept of resistance, Specific resistance, Whetstone's network, meter bridge, balancing condition of meter bridge, measurement of unknown resistance using meter bridge. Problems. 3.3 Potential , Potential drop along the length of wire, Principle of Potentiometer, Potential gradient, E.M.F. Unit, Comparison of EMF using potentiometer

UNIT-IV Modern Physics	4a. Use modern materials 4b. Use X-ray	Semiconductor – 4.1 Classification of solids on the basis of band theory: forbidden energy gap, conductor, insulator semiconductor 4.2 intrinsic, extrinsic, semiconductor doping , P and n type semiconductor electrical conduction through p and n semiconductor .P-N junction diode semiconductor metal and insulator. 4.3 Optical fibre: principle, structure of optical fibre, propagation of light wave through optical fibre, derivation of numerical aperture and acceptance angle **X-rays:** 4.4 Origin of X-rays, production of X-rays using Coolidge's X-ray tube 4.5. Minimum wavelength of X-ray derivation, properties of X-rays, applications of X- rays: engineering, medical and scientific

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1	GENERAL PROPERTIES OF MATTER	12	6	7	7	20
2	HEAT LIGHT AND SOUND	12	6	7	7	20
3	ELECTRICITY	12	6	7	7	20
4	MODERN PHYSICS	12	6	7	7	20
	TOTAL	48	24	28	28	80

Legends:
R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

7. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Experiment /Practical Exercises	Approximate Hours
1	1	Know your Physics Laboratory and use of scientific calculator & interpretation of graph.	2
2	2	Measure the dimensions of given objects using vernier caliper.	2

3	3	. Determine Young's modulus of elasticity of metal wire by using Searle's apparatus	2
4	4	Measurement of unknown temperature using platinum resistance thermometer.	2
5	5	To determine critical angle using glass block	2
6	6	. Determine coefficient of viscosity of given liquid using Stoke's Method	2
7	7	To determine specific resistance of given wire using Ohm's Law	2
8	8	To verify the Law of Resistance in series by Meter bridge.	2
9	9	To study the forward characteristics of P-N junction diode	2
10	10	To understand the concept of resonance and determine the velocity of sound in air.	2
11	11	Comparison of EMF of two cells using Potentiometer	2
Micro Project (Any one of following will be opted by a group of 5-6 students)			
1	Survey of different diodes, resistances and capacitance		
2	Prepare current and voltage rating of home appliances		
3	To make the telescope using lenses		
4	Analyse the different toys and watch on the basis of property of Elasticity		
5	Analyse the different liquidator on the basis of property of surface tension		
6	To collect the information from internet regarding distribution of sound at Gowalkonda fort		
7	To collect the information from internet regarding distribution of sound at Golghumut at Vaijapur		

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities

a. Calculate acoustics of given class room.
b. Prepare a chart of applications of optical fibre in different fields.
c. Demonstrate different types of capacitors.
d. Seminar by student on any relevant topic.

9. SPECIAL INSTRUCTIONAL STRATEGIES

a. Search various sites to teach various topics/sub topics.
b. Instead of the traditional lecture method, use different types of teaching methods such as improved lecture method, question answer method, laboratory method to attained specific outcome.
c. Some topics are relatively simpler in nature is to be given to the students for self-learning by seminar or by classroom presentations
d. Teachers provide theme to create multiple choice questions.
e. Provide super visionary assistance for completion of micro-projects.

10. Hours distribution for Physics Experiments :

Sr. No.	Description	Hours
1	An introduction to Physics laboratory and its experiments (for the set of first four experiments)	02
2	Set of first four experiments	08
3	An introduction to experiments (for the set of next four experiments)	02
4	Set of next four experiments	08
5	An introduction to experiments (for the set of next three experiments)	02
6	Set of next three experiments	06

11. SUGGESTED LEARNING RESOURCES LIST OF BOOKS

Sr No.	**Title of Books**	**Author**	**Publication**
1	Basic Science Physics	Pawar and Sutar	Nirali Publication
2	Applied Physics	B.G. Bhandarkar	Vrunda Publication
3	Engineering Physics	R.K. Gupta and S.L Gupta	Dhanpat Rai Publication
4	Applied Physics	Pawar, Umrani and Joshi	Nirali Publication
5	Basic Physics	B.G. Bhandarkar, S.N. Jumde	Vrunda Publication
6	Physics Text Book Part -1 for Class - 12	NCERT	NCERT; 2014 edition **ISBN-13:** 978-8174506313
7	Physics Text Book Part -2 for Class - 12	NCERT	NCERT; 2014 edition **ISBN-13:** 978-8174506719
8	A text book of applied physics		S Chand Publication

12. List of Major Equipment/ Instrument

1. Platinum resistance thermometer
2. Thermocouple
3. Meter bridge
4. Potentiometer

13. E-learning resources

1. www.physicsclassroom.com for unit II and unit III
2. www.fearofphysics.com for unit III
3. www.sciencejoywagon.com/physicszone for unit III and IV
4. www.science.howstuffworks.com
5. https://phet.colorado.edu/en/simulations/category/physics for unit I, II, III and IV

POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	**Student will able to calculate young's modulus ,surface tension and viscosity of different material**	3	3	3	2	0	1	0	0	0	2	-	-	-
CO2	**Student will able to demonstrate different properties of heat ,light and sound**	3	3	2	2	0	2	0	0	0	1	-	-	-
CO3	**Student will able to demonstrate different laws of electric field, charge resistance and capacitance**	3	3	3	3	0	2	1	0	0	1	-	-	-
CO4	**Student will able to demonstrate different type of semiconductors, x-ray and optical fiber knowledge and application**	3	3	3	3	0	3	0	0	0	0	-	-	-

14. Name and Designation of Course Designer

Sr. No	Name of the faculty member	Designation and Institute
1	Mr. V.S Deshmukh	Lecturer in Physics, Government Polytechnic Aurangabad
2	Mrs. S.B.Kale	Lecturer in Physics, Government Polytechnic Aurangabad
3	Mrs. Z.F.Siddiqui	Lecturer in Physics, Government Polytechnic Aurangabad

Member Secretary PBOS Chairman PBOS Co-coordinator science and Humanities

COURSE TITLE **ENGINEERING MATHEMATICS**

COURSE CODE **6G102**

Diploma program in which course is offered	Semester in which course is offered
AE	Second

1. RATIONALE:

Engineering Mathematics forms foundation to understand basic principles of Engineering Mathematics to solve engineering problems. This subject is an extension of Basic Mathematics which deals with calculus, differentiation, integration, differential equations etc. which have applications in several engineering courses of various programmes. This course aims at multi-dimensional logical thinking and reasoning capabilities of the students.

2.COMPETENCY STATEMENT:

At the end of studying this course students will be able to

"Solve engineering problems using the principles of applied mathematics."

3. COURSE OUTCOMES

Students will be able to

1. Differentiate the various function using different rules
2. Apply rules of derivatives to solve engineering problems.
3. Apply rules of integration to solve engineering problems.
4. Solve the various types of differential equations.
5. Apply principles of central tendencies for quality assurance in engineering field

4. TEACHING AND EXAMINATION SCHEME

Teaching scheme (In hours)			**Total credits (L+T+P)**	**Examination scheme**				
				Theory Marks		**Practical marks**		**Total Marks**
L	**T**	**P**	**C**	**ESE**	**PT**	**ESE**	**PA**	
03	01	00	04	80	20	--	--	100
Exam Duration				3 Hrs	1 Hr.			

Legends:

L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice(batch-wise); **P** Practical;

C – Credit; **ESE** -End Semester Examination; **PT** - Progressive Test.

5. CORSE DETAIL.

Unit	Major Learning Outcomes	Topics and Sub-topics
UNIT I Derivatives	1a.Differentiate various engineering functions	1.1 Definition of derivative, notation. 1.2 Derivative of standard functions. 1.3 Rules of Differentiation (without proof) such as sum, difference, product and quotient. 1.4 Derivative of composite functions. 1.5 Derivative of inverse trigonometric functions. 1.6 Derivative of implicit functions. 1.7 Derivative of parametric functions. 1.8 Logarithmic differentiation. 1.9 Second order derivatives.
UNIT II Applications of derivative	2a.Apply derivatives to find Velocity, Acceleration and Maxima & Minima	2.1 Tangent & normal. 2.2 Maxima & minima. 2.3 Radius of curvature.
UNIT III Integration	3a.Integrate various Functions using appropriate methods.	3.1 Definition of integration. 3.2 Integration of standard function. 3.3 Rules of Integration: sum, difference & multiplication. 3.4 Methods of Integration 3.4.1 Integration by substitution. 3.4.2 Integration by partial fraction. 3.4.3 Integration by parts. 3.5 Definition of Definite integral. 3.6 Simple problems on definite integral
UNIT IV Differential Equations	4a.Solve various types of differential equations.	4.1 Definition of differential equation, order &degree. 4.2 Formation of differential equation. 4.3 Solution of Diff. equation. 4.4.1 variable separable. 4.4.2 Homogeneous equation. 4.4.3 Exact diff. equation. 4.4.4 Linear diff. equation.
UNIT V Statistics	5a.Measure Central Tendencies 5b. Measure Dispersion for given data.	5.1 Graphical representation: Histogram & o-give curve to find Mode and median. 5.2 Measures of dispersion : Range, mean deviation and Standard deviation.

6. SUGGESTED SPRCIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Sr,no	Title/Topic	Teaching Hours	Distribution of Theory Marks			
			Remembrance levels	Understanding levels	Application levels	Total
1	Derivative	12	2	08	08	18
2	Applications of derivative	04	00	04	08	12
3	Integration	16	06	08	12	26
4	Differential Equations	10	04	04	08	16
5	Statistics	06	02	02	04	08
TOTAL		48	14	26	36	80

7. SUGGESTED LIST OF TUTORIAL

1) The exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency
2) Form a batch of 20 students and at least **ten** problems should be given to get necessary exercise.
3) Course faculty will provide programme related problems.

Sr. No.	**Title/Topic**	**Exercises/Tutorial**	**Approx. hours**
1	Derivative	Solve problems related to various methods/techniques of differentiations	03
2	Applications of derivative	Calculate Engineering Applications of Tangent, normal, maxima, minima and Radius of curvature from respective programmes.	03
3	Integration	Solve problems Related to Various Methods/Techniques of integration	04
4	Differential Equations	Solve problems Related to Various Methods/Techniques of Differential equation.	04
5	Statistics	Solve examples of Comparative data. Plot different types of graph.	02

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

Other than the classroom learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Collect the mathematical derivation based on curriculum from respective programme.
b. Identify mathematical problems related to respective programme and get them solved.
c. Find graphical software using internet and list them.
d. Identify problems based on applications of differential equations and solve these problems.

e. Prepare a seminar on any relevant topic based on curriculum.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course

a. Use open resources available on internet to teach Engineering Mathematics.
b. Apply the mathematical concepts learnt in this course to branch specific problems.
c. Use different instructional strategies in classroom teaching.

10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title	Author	Publication
1.	Mathematics for polytechnic students for second Year	S. P. Deshpande	Pune vidhyarti gruh prakshan Pune
2.	Applied Mathematics	By Patel & Rawal	Nirali prakashan Mumbai
3	Mathematics for polytechnic students for second year	G.V.Kumbhojkar	Phadke prakashan Kholapur

11. Major Equipment/ Instrument with Broad Specifications

Sr. No.	Name of the Equipment	Specification
1	NA	

12. Software/Learning Websites

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13. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	Students will be able to differentiate the various function using different rules	2	3	1	-	-	-	-	-	-	-	-	-	-
CO2	Students will be able to apply the differentiation to Velocity, Acceleration and Maxima & Minima	-	-	1	-	1	-	-	-	-	-	-	-	-
CO3	Students will be able to so Integrate the various Function using different methods	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Students will be able to solve the various types of differential equation using different methods.	1	1	3	-	-	-	-	-	-	-	-	-	-
CO5	Students will be able to Measure Central tendency and Measure Dispersion in given data	-	1	1	-	1	-	-	-	-	-	-	-	-

13. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Sr. No.	Name of the faculty member	Designation and Institute
1	Mr. M.A. Ali	Lecturer in Mathematics, Government Polytechnic, Aurangabad
2	Mr. R.B. Borulkar	Lecturer in Mathematics, Government Polytechnic, Aurangabad
3	Mrs. H.H. Bhumkar	Lecturer in Mathematics, Government Polytechnic, Aurangabad

Member Secretary PBOS	Chairman PBOS	Co-ordinator science and Humanities

COURSE TITLE- ENGINEERING DRAWING

COURSE CODE 6R201

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
AE	Second

1. RATIONALE

Engineering Drawing is the language of an engineers and technicians. Always the engineers come across different types of drawings. It is therefore very important to understand the concepts involved in drawing. The course aims at developing the ability to draw and read projections of lines/planes/solids and develops imagination and translating skills in drawing orthographic sectional and missing views of common engineering components.
It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards.

2. COMPETENCY

At the end of studying this course students will be able to

"Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments.''

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE @ (PR)	PA (TW)	100
2	-	4	6	--	--	50	50	
Duration of the Examination (Hrs)				--	--	2hrs.	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal,~ Online Examination.

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Draw orthographic views of objects.
2. Draw sectional views of objects.
3. Draw isometric views and missing view
4. Draw projections of 2D and 3D standard regular entities.
5. Draw sectional views of 3D standard solids.
6. Use various drawing codes, conventions and symbols as per IS SP-46.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Orthographic and sectional views	1a.Draw the orthographic views of object. 1b.Draw sectional orthographic views of object.	Using **First Angle** Projection Method only. 1.1 Review of orthographic projections 1.2 Conversion of pictorial view into Orthographic views. 1.3 Sectional orthographic views.
Unit - II Isometric projections	2a.Draw the isometric view from orthographic views. 2b.Use isometric scale to draw isometric projections.	2.1 Introduction 2.2 Isometric scale and its use 2.3 Conversion of orthographic views into isometric view / projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)
Unit - III Projections of Lines and Planes	3a.Draw the projection of points, lines and planes with different orientations. 3b. Find out true shape and size of a inclined line or plane.	Use of **first angle method** of projections 3.1 Projection of points. 3.2 Projection of Lines inclined to **one** reference plane only. 3.3 Projection of Planes inclined to **one** reference plane only.
Unit - IV Projection of solids	4a.Identify center, apex, corners, lines, surfaces and slant edges of regular solids. 4b.Draw the projection of Solids with different orientations.	Projection of following solids with their axes inclined to one reference plane only. (Use of first angle method of projections). 4.1 Prism and pyramids: Triangular, Square, Pentagonal and Hexagonal types. 4.2 Cylinder 4.3 Cones.
Unit - V Section of solids	5a.Draw the projection of sections of solids with different conditions and positions. 5b.Find out true shape and size of an inclined solid.	Use **First angle** projection method only. Axis of cutting plane inclined to one reference plane and parallel to other reference plane. Axis of solid perpendicular to one reference plane only. 5.1 Sectional views of solids such as Prism, pyramid, cone and cylinder

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit	Unit Title	Teaching Hours	Distribution of practical exam. Marks			
			R Level	U Level	A Level	Total Marks
I	Orthographic and sectional views	8	2	4	6	12
II	Isometric projections	6	2	4	4	10
III	Projections of Lines and Planes.	8	2	4	6	12
IV	Projection of solids	6	-	4	4	8
V	Section of solids	4	-	4	4	8
Total		**32**	**6**	**20**	**24**	**50**

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/ programme outcomes. A3 size sketch book should be used by the students. It is necessary to draw all the sheet problems in sketch book first and then redrawn on the sheets

Sr. No.	Unit Number	Practical Exercises	Hrs. required
1	I	1.1 One sheet on Orthographic projections of a given object (2 problems) 1.2 One sheet on Sectional Orthographic projections of a given object(2 problems)	4 6
2	II	2.1 One sheet on Isometric projection (2 problems)	6
3	III	3.1 One sheet on projection of lines & planes. (2+2 problems)	4

4	IV	4.1 One sheet on projection of solids (2 problems)	4
5	V	5.1 One sheet on projection of sections of solids. (2 problems)	4
6	I	Redraw any one problem using AutoCAD.	4
Total			**32**

Notes:

a. Use one sides of sheet.

b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.

c: The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. may be different for different batches.

d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.

e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.

f: For 50 marks Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to prepare drawings.

AUTO-CAD Work:

In a few practical hours students should be made conversant with auto cad 2D and 3D regular solid drawings. Simple drawings should be demonstrated to the class with use of LCD projector

One sheet on Missing Views should be redrawn by using AUTO-CAD and its Print out A4 size should be attached in sketch book by all students.

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular students activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

Sr. No.	Activities
1	Draw free hand isometric views of any components. Also draw orthographic projections of them (all views).

2	Prepare models of planes, solids of cardboard, sheets. Position it with reference to principle planes.
3	Draw simple 2D and 3D with AutoCAD.
4	List points, apex, center line, slant edges of different standard solid models available in laboratory.
5	Students should collect Production drawings, Layouts from nearby workshops/industries and visualize the part from the given views.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

Sr. no.	Unit no	Unit name	Strategy
1	I	Orthographic and sectional views	Conventional black board method, Use of models. Use of software.
2	II	Isometric projections	Conventional black board method, Use of models.
3	III	Projections of Lines and Planes	Planes made of sheet, cardboard.
4	IV	Projection of solids	models
5	V	Section of solids	Models cut section

10. SUGGESTED LEARNING RESOURCE

Sr No	Title of Book	Author and Publication
1	Elementary Engineering Drawing	N.D.Bhatt , Charotar Publishing House
2	Engineering Drawing	Mali , Chaudhari, Vrinda Publication
3	Engineering Drawing	Sidheswar Shastri , Tata Mc Graw Hill
4	Engineering Drawing	Arunoday kumar, Techmax publications, Pune.
5	Engineering Drawing for schools and colleges	IS CODE SP- 46

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Sr.No.	Major equipment/ Instrument with Broad Specification	Quantity
1	Models- full and cut. (wooden and acrylic)	12
2	Drawing equipments and instruments for class room teaching-large size.	1
3	Drawing board-half imperial size.	100
4	T-square or drafter (Drafting Machine).	1
5	AutoCad software	1

12. LEARNING WEBSITE & SOFTWARE

a) http://www.slideshare.net/sahilsahil992/conic-section-1819818
b) http://www.technologystudent.com/designpro/drawdex.htm
c) http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/
d) http://web.iitd.ac.in/~hirani/mel110-part3.pdf
e) http://www.studyvilla.com/ed.aspx
f) http://www.youtube.com/watch?v=a703_xNeDao
g) E-learning package from KOROS.
h) E-learning package from Cognifront

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	Draw orthographic views of objects.	1	3	3	1	-	-	-	3	1	-	2	2
CO2	Draw sectional views of objects.	1	3	3	1	-	-	-	3	1	-	1	2
CO3	Draw isometric views and missing view	1	3	3	1	-	-	-	3	1	-	1	2
CO4	Draw projections of 2D and 3D standard regular entities.	1	3	3	-	-	-	-	3	1	-	-	1
CO5	Draw sectional views of 3D standard solids.	1	3	3	1	-	-	-	3	1	-	-	1
CO6	Use various drawing codes,	1	2	2	-	-	-	-	2	1	-	-	2

	conventions and symbols as per IS SP-46.												

14. Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	Aher S. M.	Lecturer in Mechanical Engineering.
2	Dhirbassi G. D	Lecturer in Mechanical Engineering.

15. AUTHENTICATION (To be signed by Authorized signatories)

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE : ENGINEERING MECHANICS

COURSE CODE : 6Q201

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
AE	Second

1. RATIONALE:

Engineering Mechanics is basic technology course. The purpose of this course is to predict physical phenomena which lay the foundations for engineering applications. By applying Principles of mechanics, Diploma engineers shall be able to analyze the behavior of structural/machine components under the action of various forces. Analysis of components will form basis for design. The Course intends to provide basic understanding about the different types of forces, moments and their effects on structural/machine components. It develops basic analytical abilities.

2. COMPETENCY:

At the end of studying this course students will be able to,

"Use principles of engineering mechanics to analyze structural/machine components"

3. TEACHING AND EXAMNATION SCHEME :

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE @ (PR/OR)	PA (TW)	125
4	-	2	6	80	20	--	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; PR-** Practical**; C-**Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination.

4. COURSE OUTCOMES :

At the end of studying this course students will be able to: -

1. Classify the given force system.
2. Suggest the appropriate simple lifting machines for given situations.
3. Check the stability of engineering systems by applying force equilibrium conditions
4. Use principles of friction to analyze equilibrium of rigid bodies/simple structures for common engineering situations.
5. Locate the Centroid and Centre of gravity of components of engineering systems.

5. DETAILED COURSE CONTENTS:

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Fundamental Concepts	1a. Explain concepts of given terms 1b. Classify the given quantities 1c. Use Newton's laws of motion in given situations 1d. Use law of transmissibility in given situations	1.1 Definitions of Mechanics, Applied Mechanics, statics, dynamics, kinematics, kinetics. 1.2 Concept of space, time, mass, particle, rigid body. 1.3 Scalar and vector quantities with examples, 1.4 Newton's laws of motion. 1.5 Concept of force, definition, S.I. unit, representation of force as a vector, Bow's notation. Characteristics and effects of forces, Law of transmissibility of force.
Unit – II Simple lifting machines	2a. Suggest appropriate simple lifting machine for the given purpose along with justification 2b. Determine effort required for the load lifted by the given simple lifting machine 2c. Determine the V.R. and efficiency and law of given simple lifting machines. 2d. Draw and interpret the graphs for given data.	2.1 Definition of simple lifting machine, load, effort, mechanical advantages, velocity ratio, input of a machine, output of a machine, efficiency, and relation between MA, VR and efficiency. Ideal machine, ideal effort, ideal load, friction in machine, effort lost in friction, load lost in friction. 2.2 Law of simple machine, maximum mechanical advantage, and efficiency, reversibility of machine, condition for reversibility of machine, self-locking machine. 2.3 Velocity ratio (No derivation) for Worm and worm wheel, differential axle and wheel, Single/double purchase crab, Simple screw jack, Two and three sheave pulley block, Weston's differential pulley block. 2.4 Numerical problems based on the above machines as mentioned in article 2.3 2.5 Graphs of Load V_S Effort, Load V_S ideal effort, Load V_S Effort lost in friction, Load V_S M.A., Load V_S Efficiency

Unit - III Resolution and composition of coplanar forces	3a. Resolve the given single force. 3b. Determine analytically resultant of given force system. 3c. Determine graphically resultant of the given force system.	3.1 Concept of system of forces: Coplanar, Non coplanar, collinear, concurrent, non-concurrent, parallel (like & unlike). 3.2 Resolution of a force – Orthogonal and non orthogonal components 3.3 Composition of forces, definition of resultant, Law of parallelogram of forces and Law of polygon of forces. 3.4 Determination of resultant of collinear and concurrent force system analytically. 3.5 Moment of a force, magnitude, lever arm, types and sign convention,. Law of moment, Varignon's theorem, Couple, characteristics of couple with examples. 3.6 Resultant of parallel force system and non-concurrent, non-parallel force system by analytical method. 3.7 Resultant of parallel and concurrent coplanar force system by graphical method
Unit - IV Equilibrium of coplanar forces	4a. Draw free body diagram (F.B.D.) of a rigid body / object for the given situation. 4b. Use Lami's theorem in given situation. 4c. Determine analytically reactions for the given type of beam. 4d. Determine graphically reactions for the given simply supported beam.	4.1 Equilibrium and equilibrant, relation between resultant and equilibrant. 4.2 Concept of free body, free body diagram, Conditions of equilibrium for collinear, concurrent, parallel & non concurrent non parallel force systems. 4.3 Lami's Theorem and its applications such as cables. Lami's theorem problems with two unknowns only. 4.4 Beam-Definition, types of beam: cantilever, simply supported, over hanging, continuous, fixed beams. Types of supports: simple, fixed, hinged and roller. Types of load- point load (vertical and incline), uniformly distributed load, couple. 4.5 Beam reactions for cantilever, simply supported beam with or without overhang-subjected to combination of point load and U.D.L. or vertical point load and couple. 4.6 Using graphical method determine beam reactions for the simply supported beam (without overhang) subjected to vertical load and U.D.L.

Unit - V Friction	5a. Determine frictional force, coefficient of friction and unknown forces acting on body(s) for the given situation. 5b. Determine frictional force, coefficient of friction unknown forces acting on ladder in given situation.	5.1 Concept and definition of friction, Advantages and disadvantages of friction. Types of friction (static, dynamic, rolling, sliding), laws of friction, Definition of co-efficient of friction, angle of friction, angle of repose and relation between angle of friction and angle of repose. 5.2 Equilibrium of bodies on level plane subjected horizontal & incline force (pull and push). 5.3 Equilibrium of bodies on inclined plane subjected to parallel & incline force (pull and push). 5.4 Ladder friction. (With one surface smooth)
Unit - VI Centriod and Center of gravity	6a. Determine centroid of the given composite lamina. 6b. Determine center of gravity of the given composite solids.	6.1 Centroid- Definition, Centroid of geometrical plane figures- triangle, square, rectangle, circle, semicircle, quarter circle. 6.2 Determination of centroid of composite figures composed of not more than three geometrical regular figures. 6.3 Center of gravity- Definition, C.G. of simple regular solids- cube, cylinder, cone, sphere, hemisphere 6.4 Determination of C.G. of composite solid composed of not more than two regular solids

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
I	Fundamental Concepts	02	04	---	---	04
II	Simple lifting machine	12	02	04	06	12
III	Resolution and composition of coplanar forces	14	04	08	06	18
IV	Equilibrium of coplanar forces	14	04	06	08	18
V	Friction	12	04	04	08	16
VI	Centroid and center of gravity	10	02	04	06	12
	Total	**64**	**20**	**26**	**34**	**80**

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy*

7. LIST OF PRACTICAL / LABORATORY EXPERIMENTS/ TUTORIALS :

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
	Practical performance on any three lifting machines from 1 to 5		
1	II	Use differential axle and wheel to establish law of machine and find maximum efficiency	04
2	II	Use simple screw jack to establish law of machine and find maximum efficiency	04
3	II	Use single or double purchase crab to establish law of machine and find maximum efficiency	04
4	II	Use two sheave or three sheave pulley block to establish law of machine and find maximum efficiency	04
5	II	Use Weston's differential pulley to establish law of machine and find maximum efficiency	04
6	III	Use force table to determine resultant of coplanar concurrent force system applying law of polygon of forces	04
7	III	Use law of moment apparatus to determine unknown forces.	02
8	IV	Use force table to find unknown forces by applying Lami's theorem.	02
9	IV	Use beam reaction apparatus to check equilibrium of parallel forces.	02
10	V	Use friction apparatus to determine coefficient of friction for motion on horizontal plane (for two pairs of different contact surfaces)	04
11	V	Use friction apparatus to determine coefficient of friction for motion on incline plane (for two pairs of different contact surfaces)	04
12	VI	Determine centroid of geometrical plane figures	02
TOTAL			**32**

8. SUGGESTED STUDENTS ACTIVITIES:

Other than class room and laboratory activities following are the suggested co-curricular students activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences.

SR. NO.	ACTIVITY
1	Collect photographs of concurrent ,Parallel, general force system in equilibrium
2	Illustrate practical situations where friction is essential and not essential
3	For given situations(three) suggest appropriate simple lifting machine
4	Collect photographs where hinge, roller and fixed supports are used.
5	Prepare model of irregular geometrical figure and locate it's centroid

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES:

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-

b. Q & A technique.

c. Demonstration.

d. Activity based learning.

f. Use of video, animation films to explain concepts, facts and applications of mechanics.

10. SUGGESTED LEARNING RESOURCE:

S.No.	Name of Book	Author	Publication
1	Applied Mechanics	R. S. Khurmi	Dhanpat Rai & Sons, Delhi.
2	Engineering Mechanics	S. S. Bhavikatti	I. K. International Publishing House Pvt. Ltd., New Delhi
3	Engineering Mechanics (Static and Dynamics)	A. Nelson	Tata McGraw Hill Co., Delhi.
4	Fundamental of Applied Mechanics (SI Version)	Dadhe, Jamdar, Walavalkar	Sarita Prakashan, Pune
5	Engineering Mechanics	Dr.S. M. Dumne	Nikita Publication, Latur.
6	Engineering Mechanics	Dr.Abhishek Jain	Invincible Publishers
7	Engineering Mechanics	Dr.R.K.Bansal	Laxmi Publication,ISBN-978-81-318-0078-2

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Sr. No.	Name of equipment	Brief specification
1	Universal Force Table	A circular 40 cm diameter aluminum disc, graduated into 360 degrees. Leveling screws clamping devices to fix the table to desired angle, six sliding clamp pulleys, control ring, string and six sets of iron nickel slotted weigh
2	Law of moment apparatus	A stainless steel graduated beam 12.5 mm square in section, 1m long, pivoted at center. The top of beam is provided with notches at the interval of 10mm for carrying hanger weights with spirit bubble level tube with necessary slotted weights, hanger
3	Beam reaction apparatus	Two circular dial type 10 kg, extension spring balances or tube in tube type. Complete with suitable stands, a wooden beam with scale and slots at regular intervals, four stirrups with hooks and necessary slotted weights, hanger
4	Friction apparatus	Base to which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees. A 5 cm diameter friction less pulley is attached to the end by means of a clamp adjustable to any necessary position. Two weight boxes 01 of 5 gm,01 of 10 gm, 02 of 20 gm, 02 of 50 gm, 02 of 100 gm weight, Boxes each weighing 300 gm with 8 mm ply case and bottom of different surfaces.
5	Simple screw jack	Screw of pitch of 5mm carrying a double flanged turn table 20 cm diameter fitted on steel base and two adjustable pulleys, cords and hooks.
6	Worm and worm wheel	Threaded spindle, load drum, effort wheel; necessary slotted weights, hanger and thread
7	Weston's differential pulley	Two pulleys; one bigger and other smaller. Both pulleys are rigidly fixed to each other with same center and mounted on same shaft. They have cogs around periphery and having continuous chain passing around these pulleys along with snatch block.

8	Differential axle and wheel	A wheel of 40 cm diameter and axles are of different diameter 20 cm and 10 cm giving a ratio of 1:2:4 ; with common axis and supported on ball bearings in iron brackets, necessary slotted weights, hanger and thread.
9	Single purchase winch crab	Effort wheel of C.I. material having 25 cm diameter mounted on a shaft of about 40mm diameter on the same shaft, a geared wheel of 15 cm diameter is mounted. The teeth of pinion wheel shall mesh with spur toothed wheel of 30 cm diameter is mounted on another axle to which load drum of about 7.5 cm diameter, necessary slotted weights, hanger and thread)
10	Double purchase winch crab	A winch having assembly same as that of single purchase crab winch except an additional set of gearing arrangement.
11	Two sheave and three sheave pulley blocks	Double sheave pulley blocks of diameter 65-205 mm,ropediameter10-40 mm and carrying maximum safe working load 500kg Triple sheave pulley blocks of diameter 65-205 mm,rope diameter 10-40 mm and carrying maximum safe load 3600kg

12. LEARNING WEBSITE & SOFTWARE:

i. www.youtube.com for videos regarding simple lifting machines and friction
ii. www.nptel.ac.in:for learning materials with audio and video in technical education
iii. www.discoveryforengineers.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs) :

Sr. No	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Classify the given force system.	3	2	1	1	-	-	-	-	-	-	-	-
2	Select the appropriate simple lifting machines for given situations.	2	2	3	2	-	-	-	-	-	-	-	-

3	Check the stability of engineering systems by applying force equilibrium conditions	2	3	2	1	-	-	-	-	-	-	-	-
4	Use principles of friction to analyze equilibrium of rigid bodies/simple structures for common engineering situations.	2	3	2	1	-	-	-	-	-	-	-	-
5	Locate the Centroid and Centre of gravity of components of engineering systems.	2	2	3	2	-	-	-	-	-	-	-	-

Course Curriculum Design Committee:

Sr No	**Name of the faculty members**	**Designation and Institute**
1	Madhuri Ganorkar	Head of Applied Mechanics Department, Govt. Polytechnic, Aurangabad
2	Ganesh Kechkar	Lecturer in Applied Mechanics, Govt. Polytechnic, Aurangabad
3	Rajesh Aghav	Lecturer in Applied Mechanics, Govt. Polytechnic, Aurangabad
4	Dr.Shivaji Dumne	Lecturer in Applied Mechanics, Govt. Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- BICYCLE TECHNOLOGY

COURSE CODE 6A401

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Second

1. RATIONALE

This is one of the Applied Technology (AT) courses. In order to offer Programme Specific Technology (PST) courses right from the first year itself it is introduced for the first time in the programme curriculum. All motor vehicles are a natural extension of a bicycle as per history of automobile and it is a primitive vehicle that uses muscular power. Further its technology was used to prepare motor cycle, quadric-cycle and final a car. Hence this course is introduced.

2. COMPETENCY

At the end of studying this course students will be able to

"**Establish analogy between bicycle and motor cycle**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	50
1	-	2	3	--	--	25@	25	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Select a bicycle for a given purpose based on standard specification
2. Inspect parts of a given bicycle
3. Dismantle and assemble bicycle using standard engineering tools
4. Prepare an essay on use of bicycle for managing physical self and fuel conservation
5. Prepare a plan for preventive maintenance of a given bicycle

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I History of Muscular power machines & Bicycle	1a. Explain need based evolution of bicycles 1b. Explain contribution of different persons in development of bicycle 1c. Appreciate bicycle as a first machine to use appropriate muscle power 1d. Explain machines used before first use of bicycle 1e. Write article on use of bicycle in maintaining health	1.1 Pre-Driassanne era- use of hand muscle power 1.2 Karl von Draise and first bicycle – need and construction & Gomez hand driven vehicle 1.3 Kirkpatrick Macmillan velocipede 1.4 The ordinary – high front wheel bicycle 1.5 Bantom gear driven bicycle and Staley safety bicycle 1.6 World famous brands of bicycle and bicycle races as a sport
Unit - II Human power as a source of energy	2a. Use a bicycle scientifically in exercise 2b. Practice breathing while cycling 2c. Maintain body temperature	2.1 Analogy of human body and Prime mover- Engine, motors 2.2 Muscle chemistry and power generation – types of power generation mechanism- aerobic and anaerobic, ATP, 2.3 Breathing- need and its rate 2.4 Maximum performance and time 2.5 Pedal effort, torque, power and output 2.6 Keeping body cool to maximize power
Unit - III Transmission system of bicycle	3a. Set chain tension 3b. Maintain transmission system	3.1 Need – Mechanical advantage, speed, torque, coasting and types of transmission systems in bicycle

	3c. Remove and refit crank set 3d. identify fault based on symptom propose remedies	3.2 Conventional transmission system- Crank set, chain wheel, chain and freewheel 3.3 Advanced transmission system – cogged wheels, derailleurs- front and rear 3.4 Other transmission systems for bicycle 3.5 Maintenance of transmission system
Unit - IV Frame & suspension of bicycles	4a. Compare bicycles based on specifications 4b. Maintain frames and front fork and chain stay 4c. Describe advanced frames for proper functioning	4.1 Requirements & types of bicycle frames and size of the bicycles 4.2 Parts of bicycle frame – Main tube (steering tube), Top tube, down tube, seat tube, bottom bracket, chain stay, seat stay, front fork, saddle 4.3 Material used for frame- steel, aluminum, carbon 4.4 Fabrication of frame 4.5 Advance frames in bicycles - construction and features 4.6 Maintenance of frames 4.7 Suspension- need, types, construction and working
Unit – V Axles and wheels of bicycle	5a. Remove and refit bicycle tire and tube 5b. Perform truing operation of wheels 5c. Compare advance wheels with spoke wheel	5.1 Requirement of wheels and their types-location, construction, tube tyre, tubeless, solid rubber tyres 5.2 Parts of conventional wheels – hub, spoke, rim 5.3 Evolution, advantages and disadvantages of spoke wheels 5.4 Disc and light alloy wheels 5.5 Maintenance of wheels

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	History	02	--	--	--	--
2	Human power	04	--	--	--	--
3	Transmission system	04	--	--	--	--
4	Frames and suspensions	02	--	--	--	--
5	Axles, hubs and wheels	04	--	--	--	--
		16				

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Critical study of different bicycles	2
2	03	Dismantling and assembly of head set	4
3	04	Dismantling and assembly of crank set	2
4	06	Removal and replace wheels	2
5	06	Removal of tube puncture	2
6	05	Study different frames based on IS specification	2
7	04	Set handle	2
8	04	Set brakes – caliper & disc	2
9	03	Set chain tension	2
10	03	Set gear derailleur	4
11	06	Study of bike with front and rear suspension	2
12	03	Remove and replace free wheels	4
13	06	Perform Balancing of wheels	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey for various bicycle makes

b. Field survey of bicycles and its parts

c. Explore various bicycle races organizer all over the world

d. Formation of a Bicycle club

e. Organization a bicycle rally for promotion of fuel conservation

f. Organization of an event to promote use bicycle in maintenance of physical self

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Bicycling science	Frank Rowland Whitt & D G Wilson	MIT Press, Cambridge
2.	Bike repair & Maintenance for dummies	Dennis Bailey and Keith Gates	Wiley Publishing, Inc.
3	The world history of automobile	Eric Eckermann	SAE, Warrendale PA
4	My life and work	Henry Ford	Manybooks.net
5	Complete Guide to Bicycle Maintenance and Repairs	Wolf. R.,	Rodale Press, Pennsylvania, USA 1986
6	Bicycle terminology	MIT	MIT

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Bicycles – conventional, geared with front and rear suspension and disc brakes	As per Bicycle industry specification
2.	Aggregates of bicycles	As per Bicycle industry specification
4	Bicycle tools	As per Bicycle industry specification
5	Frames	As per Bicycle industry specification
6	Spares	As per Bicycle industry specification
7	Wheel Trueing machine	As per Bicycle industry specification

12. LEARNING WEBSITE & SOFTWARE

a. https://hercules.in
b. https://bsahercules.com/
c. www.herocycles.com
d. www.cosmobikeshow.com/en
e. http://www.allrefer.com/15-extremely-popular-bicycle-brands-world
f. http://www.letour.com/us/
g. www.shimano.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Apply knowledge of bicycle in knowing motor cycle	03	03	--	--	03	--	--	--	--	--	03	--
2	Select a bicycle for given purpose based on standard specification	--	03	--	--	03	--	--	--	--	--	--	03
3	Identify parts of a given bicycle	--	03	--	--	--	--	--	--	03		03	03

4	Dismantle and assemble bicycle using standard engineering tools	--	03	--	03	--	--	--	--	--	--	--	03
5	Write an essay on use of bicycle for managing physical self and fuel conservation	--	03	--	--	05	03	--	--	03	--	--	--
6	Plan maintenance of a given bicycle	--	03	--	03	--	--	--	--	--	--	03	03

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE: -DEVELOPMENT OF LIFE SKILLS

COURSE CODE:- 6G303

Diploma Programme in which this course is offered	Semester in which course is offered
AE	Second

1 RATIONALE

The generic skills are lifelong skills which need to be developed continuously. These skills are necessary for diploma engineers for their professional career.

This course aims to develop interpersonal skills, problem solving, decision making, Professionalism with etiquettes, ethics and value system.

This course also aims at developing an engineer as a team leader, effective member of the team and to become sound personality. It will develop the abilities and skills to perform at highest degree of quality as an individual.

2 COMPETENCY

"Develop life skills to enhance personal effectiveness, professionalism and optimal use of resources."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PT	ESE	PA	
0	0	2	2	00	00	25	25	50

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE OUTCOMES (COs)

1. Develop interpersonal skills.
2. Exhibit corporate etiquettes and professionalism.
3. Enhance personal effectiveness and body language
4. Practice time management and goal setting technique
5. Develop presentation skills.
6. Manage Stress at workplaces

5 COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I Self Analysis	1a. Identify Strengths and weaknesses of an individual 1b.Identify opportunities, threats in different situations. 1c. Describe principle of Need Base Theory	**Self-Analysis** 1.1 Strength, weaknesses, opportunities and threats 1.2 Techniques of self-control 1.3 Understanding Need base Theory — Attitude, aptitude, assertiveness, self-esteem, Confidence 1.4 Understanding Self
Unit– II Communication Skills& Presentation Skills	2a. Identify techniques of communications. 2b. Describe Body language techniques 2c. Understand the principle Eye contact and facial expression. 2d. Develop appropriate presentation Skills. 2e. Use multimedia tools and technology for effective presentation. 2f. Conduct Group discussion and Interviews.	**Communication Skills& Presentation Skills** 2.1 Techniques of communication skills, 2.2 Body language, Dress like the audience, Posture, Gestures, Eye contact and facial expression. 2.3 Presentation Skill –Stage fright, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. 2.4 Group discussion and Interview technique, Use of aids –OHP, LCD projector, white board
Unit III Interpersonal communication and Corporate and Etiquettes	3a. exhibit/apply inter personal skills in different situations. 3b. Practice manners and Etiquettes.	**Interpersonal communication and Corporate and Etiquettes** 3.1 Interpersonal communication. Through Self Development and

		change. 3.2 Polished personal habits 3.3 Ethics & Etiquettes: a way of life, what are ethics, how ethics help to ensure positive interpersonal relations, 3.4 Personal value system, Personal Attire & Grooming 3.5 Cell phone manners
Unit IV **Time Management and goal setting.**	4a. Understand importance of time management. 4b. Apply time management skills. 4c. Set the goals for career growth.	**Time management and Goal Setting** 4.1 Time management skills in groups for completion of project 4.2 Factors that lead to time loss and how they can be avoided 4.3 Time matrix & urgent versus, Important jobs 4.4 Importance of goal setting 4.5 How to set SMART goals.
Unit V **Health and Stress Management**	4a. Manage health for personal efficiency. 4b. Describe Stress Management, 4c. Use strategies to overcome stress 4d Understand emotions	**Health and Stress Management** 5.1 Importance of health management, 5.2 Relevance of it, 5.3 Tips to maintain good health 5.4 Strategies to overcome stress, understanding importance of good health to avoid stress. 5.5 Stresses in groups,

		understand and identify emotions, how to control emotions, emotional intelligence.
Unit VI **Problem Solving Techniques and Creativity**	6a. participate in technical Quizzes and puzzles. 6b.Use problem solving techniques 6c. Describe factors enhancing creativity	**Problem Solving Techniques and Creativity** 6.1 definition of problem, types 6.2 solving Puzzles and technical quizzes. 6.3 Reducing conflict by preventing problems in the classroom. 6.4 Creativity concept, Tips and ways to increase creativity, importance of creativity.

6 SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Self-Analysis	4	NA	NA	NA	NA
II	Communication Skills & Presentation Skills	6	NA	NA	NA	NA
III	Interpersonal communication and Corporate and Etiquettes	6	NA	NA	NA	NA
IV	Time management and Goal Setting	6	NA	NA	NA	NA
V	Health and Stress Management	6	NA	NA	NA	NA

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
VI	Problem Solving Techniques and Creativity	4	NA	NA	NA	NA

Legends: R = Remembrance; U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED EXERCISES/PRACTICALS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1) Analyze self with SWOT techniques.	04
2	II	2) Present a topic (related to technical advancement should be given to a group of five to six students. Group should search the necessary information from various sources and prepare a systematic power point presentation. All such presentations should be delivered in front of class by groups. Presentations are to be evaluated by teacher).	04

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
3	II	3) Deliver extempore (Topic will be given to the individual for a speech of 5 to 8 minutes. Here the individual speeches of students will be conducted and evaluated by group of students.)	04
4	II	4) Participate in Group Discussion (Teacher should form group of six to eight students and give topics for group discussion. Group discussions should be carried out and evaluated by teacher)	04
5	III	5) Exhibit Etiquettes in different situations (Visit to any one place like office/firm/development sites etc. and observe the communication and etiquettes.)	04
6	IV	6) Prepare your individual time table for a week - a) List down your daily activities. b) Decide priorities to be given according to the urgency and importance of the activities. c) Find out your time wasters and mention the corrective measures. d) Set short term and long term goal for PT/TEE/Gymkhana -sport/gathering event etc.	04
7	V	7) Demonstrate simple Yoga postures and other stress relieving techniques by professional persons and narrate his/her experiences.	04
8	VI	8) Participate in Quizzes, puzzle- solving and educational games and narrate his/her experiences.	04
Total			**32**

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- Following activities will be undertaken as per their convenience. students are advice to submit their report about participation in activities.
- 1. Case studies to be discussed in a group and presentation of the same by group /group leader.

- Carry out Field exercises and prepare reports. (e.g. interact with supplier/trader and discuss about techno commercial specifications of product)
- Role play by individual/group leader.
- Sharing of self -experiences in a group.
- Brain storming sessions in a group
- Questionnaire -filling & discussing results of the same in a group.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Motivate students to use internet and collect information about various generic skills

ii. Arrange expert lecture on various topics on (two/three) SWOT analysis/Time management/Etiquettes / stress management/health management.etc.

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Title of Book	Author	Publication
1	Pearson Education Asia	Organizational Behavior	Tata McGraw Hill
2	Marshall Cooks	Adams Time management	Viva Books
3	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
4	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
5	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
6	You can win	Mr. Shiv Khera	Macmillan ,India Ltd.
7	Wings of Fire	Mr .Abdul Kalam	Universities Press
8	Prabhavi Vyaktimatwa	SEEMA GUPTA	SAKET PUBLICATION
9	Yoga Dipika	Mr. Iyyengar	Rohan prakashan
10	Tan Tanavache Niyojan (Marathi)	Dr. Anand Nadkarni	Majestic Publishing House

S. No.	Title of Book	Author	Publication
11	Tandrust Raha ,Mast Jaga.(Marathi)	Dr. Rajiv Sharangpani	Continental Prakashan

11. POs and PSOs assignment and its strength of assignment with each CO of the Course

CO. NO.	Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CO1	Develop interpersonal communication				2				2	3			
CO2	Display corporate etiquettes and professionalism		2			2			2				
CO3	Improve personality and body language			2							2		
CO4	Practice time management and goal setting technique	2		2					2	2			
CO5	Develop presentation and group discussion technique		2		2			2					
CO6	Acquire Stress removing and Problem solving technique		2			2					2		

12. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Dr.Uday V. Pise	Head of Department , Mechanical Engg. Govt. Polytechnic, Aurangabad
2	Prof. R. T. Aghao	Lecturer in Applied Mechanics., Govt. Polytechnic, Aurangabad

13. AUTHENTICATION (To be signed by Authorized signatories)

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- HISTORY OF AUTMOBILE

COURSE CODE 6A301

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Third

1. RATIONALE

History of Automobile is one of the Allied courses offered by the Programme Department (PD). It is a multidisciplinary course in which students study All Aspects of Automobile Industry (AAAI) viz. social, political, technical, legal, environmental, and economical at one place. Moreover students study evolution of motor vehicle in general and related fields of design, production, repairs and servicing of motor vehicles in particular. It helps in achieving programme outcomes from 5 to 7 related to liberal sciences which otherwise are difficult to attain.

2. COMPETENCY

At the end of studying this course students will be able to

"Anticipate impact of the professional engineering solutions in societal and environmental contexts

"Demonstrate the knowledge of and need for sustainable development."

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	50
2	1	--	3	--	--	25@	25	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Anticipate future auto technology by studying history automobile
2. Differentiate between automotive technologies among four eras in history of automobile
3. Use contemporary socio-economical situations in development of motor vehicle
4. Explain contribution of local and global political issues on changes in constitution of motor vehicles and business related to them
5. State evolution of various systems
6. Describe development of a motor vehicle from an industrial product to a consumer good

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit I Introduction to history and Quest for prime mover	1a. Appreciate use of human leg as source of muscle power 1b. Describe evolution of IC engine 1c. Describe importance of work of Otto in motorization	1.1 Need of studying history of Auto industry 1.2 Development of animal drawn vehicle 1.3 Search for prime mover for mass motorization- Atmospheric engine, steam engine and IC engine 1.4 N.A. Otto and his contribution towards the quest for engines 1.5 Motorization as crises
UNIT II Pioneering era 1884-1917	2a. Describe about contribution of Daimler, Maybach, Benz, Ford and France in motorization 2b. Describe changes on society and workers of mass production 2c. Explain effect of use of motor vehicles on WWI	2.1 Duetz & Grandfather clock engine, walking machine, by Daimler and Maybach 2.2 Emergence of karl Benz and his motorwagen 2.3 France as a pacemaker in motorization 2.4 Tin Lizzy and Fordism 2.5 Commercial vehicles and their use in WW-I
UNIT III Automobile as an Industrial product 1919-1945	3a. Describe auto industry and technology of 1930s 3b. Compare North American and European society for mind set	3.1 Automobile industry and automotive technology in 1930s 3.2 Diesel engine arrives on

	3c. Explain evolution of diesel engine as a prime mover	auto scene 3.3 Motorized forces in world war II 3.4 Commercial vehicles and buses 1919 to 1939 3.5 Europe between imitator and independent
UNIT IV Mass produced motor vehicle 1946 - 1979	4a. Explain auto industry and technology of 1950s 4b. Describe effect of VW Beattle and BMC Mini on automobile industry and the world 4c. Explain emergence Japanese Auto Industry and its effect on North America and Europe	4.1 Automobile industry and automotive technology in 1950s 4.2 Blacksmith to OBD 4.3 The beetle and Mini with new directions 4.4 German Automobile Industry 4.5 Emergence of Japanese auto industry as challenge
UNIT V Automobile as a consumer good 1980-2000	5a. Explain effect of energy, pollution and accident crises on development of MV 5b. Describe Auto industry and technology during 1980 to 2000 5c. Explain evolution of alternate fuels, engines and drive system	5.1 New Horizons through electronics 5.2 Automobile production in other countries 5.3 Automobile industry and automotive technology of 1980 -2000 5.4 Commercial vehicles and buses 1945-2000 5.5 Alternative fuels, engines and drive system
UNIT VI History of Indian auto industry 1991 – today)	6a. Explain pre LPG era about auto industry and technology in India 6b. Explain evolution of environ norms and Indian Fuel Policy and its effect of automotive technology & society 6c. Describe significance of Automotive mission plan in emerging Indian Auto Industry as Global Hub	6.1 Pre LPG era of Indian auto industry 6.2 Maruti Motors as a trend setter 6.3 Environmental norms & Indian Fuel Policy 6.4 AMP 2006-2016 and road map for global hub 6.5 Indian fuel policy 2025 and challenges before auto industry

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Quest for Prime mover	04	--	--	--	--
2	Pioneering era	04	--	--	--	--
3	Automobile as Industrial Product	08	--	--	--	--
4	Mass produced Motor vehicle	08	--	--	--	--
5	Automobile as Consumer Good	04	--	--	--	--
6	History of Indian Auto Industry	04	--	--	--	--

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Study Biography of N A Otto	2
2	2	Study Biography of Henry Ford	2
3	3	Contribution of Wilhelm Maybach in development of Mercedes Benz	2
4	4	Study of Trend setting vehicles viz. T Model, Volkswagen bettle, Morris Mini, for their appearance and effect on society	2
5	5	Automobile as a consumer good - study	2
6	6	Study various policy and plans of Indian auto industry to emerge as global hub in production of motor vehicles	2
7	5	Study evolution of Japanese automobile industry	2
8	2,3,4	Prepare blow of any great personality from auto field	2
		Total	16

8. SUGGESTED STUDENTS ACTIVITIES.

a. Internet Survey of Motor vehicle history

b. Field survey of antique motor vehicles and its parts

c. Study biography of great personalities of automobile field

d. Participate in events like restoration, exhibitions, race of old vehicles

e. Prepare blow of great personalities of automobile industry

f. Organization of Quiz on historical events

g. Organize vintage car exhibition/ rally

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Seminars
e. Activity based learning
f. Group discussion

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	The world History of Automobile	Eric Eckermann	SAE
2.	Indian Fuel Policy	Committee report	GOI
3	Auto Policy	Committee	GOI
4	Automotive Mission Plan 2006-2016	Committee	GOI
5	My life and work	Henry Ford	
6	The birth of Chrysler corporation and its legacy	Carl Breer	SAE
7	The Automobile: A Century of Progress	SAE	SAE
8	Carriages Without Horses: J. Frank Duryea and the Birth of the American Automobile Industry	Richard P. Scharchburg	SAE

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Computer	As per Auto industry specification
2.	Internet	As per Auto industry specification
4	Computer lab	As per Auto industry specification
5	Printer	As per Auto industry specification
6	Photo copy machine	As per Auto industry specification
7	Membership of professional bodies	As per Auto industry specification

12. LEARNING WEBSITE & SOFTWARE

1. www.saeindia.com
2. www.araiindia.com
3. http://www.sae.org
4. Websites of Multinational OEMs

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

SNo	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Appreciate importance of studying history in general and that of automobile in particular.	--	02	--	--	03	--	03		03	02	--	--
2	Describe significance of various era in history of automobile in development of industry and technology	--	--	--	--	03	--	03	--	03	02	--	03

3	Describe effect of contemporary socio economical situations on development of motor vehicle	--	--	--	--	03	03			03			
4	Explain contribution of local and global political issues on changes in constitution of motor vehicles and business related to them	--	03	--	--	03	--	--	--	--		02	03
5	State evolution of various systems viz. propulsion unit, transmission, axles and wheels, safety systems, comfort systems, convenience system, security systems, electrical systems etc over the years	--	03	--	--	03	--	--	--	03	--	03	03
6	Describe development of a motor vehicle from an industrial product to a consumer good	--	03	--	03	--	--	--	--	03	--	--	--

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic,Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- Mechanics of Thermal Systems

COURSE CODE 6A201

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Third

1. RATIONALE

This course from basic technology courses category introduces budding automobile Engineering technician (AET) static and dynamics aspects of all sorts of thermal systems. It further introduces them to certain fundamental thermal machines and systems based on which s/he can observe, describe, interpret and interact with various thermal systems associated with every motor vehicle during its life cycle. A motor vehicle though comprises of various systems with different names like energy supply system, transmission system, safety systems, comfort systems, security systems, convenience systems, pollution prevention systems etc. all these subsystems contain thermal systems in a form or the other. Further they are also a part of many other engineering systems that contributes in manufacturing, servicing and repairs of motor vehicles. As modern diesel engines are turbocharged, student should understand the working principles and constructions of air compressor and gas turbines. Heat transfer is basis of different components like condenser, radiators, cooling fins, etc. Hence students should have capability to calculate the necessary parameters.

2. COMPETENCY

At the end of studying this course students will be able to

"**Perform analysis of thermal energy absorbing and producing systems related motor vehicle in particular and mechanical engineering systems in general**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Correlate the theoretical knowledge with practical aspects of systems, surrounding and boundaries of work producing and work absorbing devices like condenser, air compressor, gas turbine, engine etc.
2. Calculate efficiency of power cycles.
3. Locate and identify various parts of given work absorbing and work producing system which used to improve their efficiency.
4. Describe the construction and working of gas turbine and compare different methods used to improve the efficiency viz. regeneration, inter-cooling and reheating.
5. Justify the need of design of given heat exchanger as per application.
6. Locate various parts of refrigeration system and trace the flow of refrigerant through entire system.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Fundamental concepts of thermodynamics and processes	1a. Identify the boundary, surrounding and universe of any given thermodynamic system. 1b. Draw the P-V, T-S representation of any given thermodynamic process / cycle 1c. State the law of thermodynamics.	1.1 Basic concepts of system, boundary, surrounding, universe, extensive and intensive properties ,open system, closed system, isolated, steady flow energy equation, internal energy, enthalpy, entropy. 1.2 Law of thermodynamics- Zeroth law, First and Second law of thermodynamics, boyle's law, charles law, gay lussac law, joule's law, avogadro's law, general gas equation, characteristics and universal gas constant, specific heats of ideal gases and their relationship. 1.3 Thermodynamic processes-

		isobaric, isochoric, isothermal, isentropic, polytropic with representation on p-v and t-s diagram, work done, change in internal energy, change in enthalpy and relation between P,V and T (derivations only for isentropic process and simple numerical on thermodynamic process).
Unit - II Power cycles	2a. Draw air standard, carnot and rankine cycles. 2b. Calculate performance parameter of given power cycle.	2.1 Air Standard Cycle, Assumptions, P-V and T-S diagram and equations for air standard efficiency of Otto, Diesel & Dual combustion cycle. (Simple Numerical on Otto & Diesel Cycle) 2.2 Formation of steam, Phase changes, Properties of steam, Carnot cycle, Rankine-cycle, comparison of carnot cycle and rankine cycle.
Unit - III Air Compressors	3a. Identify the type of any given air compressor. 3b. List the methods of energy saving thermodynamic process. 3c. Justify the need of multistage in air compressor. 3d. Suggest air compressor on the base of application.	3.1 Various uses of compressed air, classification of compressors and their comparative study (dynamic and positive displacement compressor). 3.2 Air-compressor terminology- free air delivered, capacity of compressor, piston displacement i.p., b.p., volumetric efficiency, isothermal efficiency, overall isothermal or compressor efficiency. 3.3 Construction and working of single stage and two stage reciprocating air compressors with P.V diagram. Necessity of multistage and inter-cooling.(Simple Numerical on single stage reciprocating air

		compressor). 3.4 Construction & working of rotary compressors- centrifugal compressor, axial flow compressor, screw. compressor
Unit - IV Gas Turbines	4a. Classify gas turbines. 4b. Describe method to improve the efficiency of gas turbine. 4c. Identify the different parts of given automotive turbine.	4.1 Classification and applications of gas turbine, Constant volume and pressure gas turbines. Closed cycle and open cycle gas turbines and their comparison. 4.2 Methods to improve thermal efficiency of gas turbine viz. regeneration, inter- cooling, reheating and representation on T-S diagram. 4.3 Principles of automotive turbocharger and supercharger (construction and working).
Unit – V Introduction to mode of heat transfer and heat exchanger	5a. Describe the different mode of heat transfer. 5b. Calculate rate of heat transfer through composite walls. 5c. Identify the type of given heat exchanger. 5d. Suggest the heat exchanger on the base of application.	5.1 Modes of heat transfer- conduction, convection and radiation. 5.2 Heat transfer by Conduction- Fourier's law, thermal conductivity, conduction through cylinders, thermal resistance, composite walls, combined conduction and convection, type of fins and factor affecting on their efficiency. (simple numerical on conduction and convection through composite walls) 5.3 Heat transfer by Radiation- Thermal radiation, absorptive, transmissivity, reflectivity, emissivity, black and gray bodies, and Stefan-Boltzmann law. 5.4 Heat exchanger- shell and tube, plate type, multiphase heat exchanger, study of heat transfer through automotive radiator.

Unit – VI Refrigeration and Air- Conditioning	6a. Describe the components and application of vapor compression system. 6b. Calculate COP of given air conditioning system. 6c. Read psychometric chart for given condition of air.	6.1 Refrigeration cycle, tones of refrigeration, coefficient of performance. 6.2 Vapor compression system, their function and location with example (Window air conditioning system, Water cooler and automotive air conditioner) Sub cooling and superheating, representation on p-h, T-S diagrams. 6.3 Simple and modified vapor absorption refrigeration system and their applications. 6.4 Types of refrigerant and their effects on atmosphere. 6.5 Psychrometry: Properties of moist air viz. dry bulb temperature, wet bulb temperature, dew point temperature, specific humidity, relative humidity. Dalton's law of partial pressure, reading of psychometric chart, psychometric processes-sensible heating / cooling, humidification, dehumidification and evaporative cooling.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Fundamental concepts of thermodynamics and processes	10	02	04	08	14
2	Power cycles	8	02	06	04	12
3	Air Compressors	8	02	06	04	12
4	Gas Turbines	6	04	06	04	14
5	Heat transfer	6	02	04	06	12

6	Refrigeration and air-conditioning	10	04	06	06	16
	Total	48	16	32	32	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Demonstration and error calculation of various temperature measuring instruments.	2
2	01	Demonstration and error calculation of various pressure measuring instruments	2
3	01	Constant pressure heating of water (solid to vapour transformation)	2
4	02	Determine Sensible heat and latent heat of vaporization water.	2
5	02	Reading of steam table, Mollier charts and psychometric charts for given conditions.	4
6	02	Demonstration of Boiler and Boiler mountings.	2
7	02	Demonstration of Otto cycle through SI Engine.	2
8	02	Demonstration of diesel Cycle through CI Engine.	2
9	03	Comparative study of Internal Combustion Engine and single stage reciprocating compressor (construction, working and thermodynamic cycle).	2
10	03	Determine Volumetric efficiency of reciprocating compressor.	2
11	04	Demonstration of automotive turbocharger and supercharger.	2
12	05	Determine thermal conductivity of metal rod.	2
13	05	Determine heat transfer coefficient in natural / force convection.	2
14	06	Demonstration of HVAC system of Automotive.	2
15	06	Trial on Refrigeration Test Rig for calculation of COP, power required and refrigeration effect.	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Collect and write technical specification of Steam Boiler.

b. Collect and write technical specification of different type of fins used in thermal systems.

c. Prepare a report on visit (domestic water waste processing plant / solar water heating process).

d. Collection and analysis of Manufacturer's Catalogue for Reciprocating / Rotary Compressor.

e. Mini project in the group of min. 2 and max. 5 students.

f. Organization of technical quiz / poster presentation on advancement in thermal system.

g. Report writing and seminar on any topic of thermodynamic system.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	A text book of thermal engineering	Khurmi& Gupta	S. Chand
2.	Thermal Engineering	Rao A.S.	Satya
3	Engineering thermodynamics	Nag P.K	Tata McGraw Hills
4	Thermal Engineering	Domkundwar & Kothandaraman	Dhanpat Rai

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1	Two Stage Air Compressor Test Rig	Two Stage Cylinder Driven by Electric Motor, Manifold Tank 81

		Ltrs., Flow Measurement by Orifice meter with Manometer Air Tank (with safety valve, shut off valve, Capacity 145 Ltrs), Pressure Gauge Bourdon Type, Control Panel followed by RPM Indicator with Proximity sensor, Energy meter, Digital Temp. Indicator (0-199.9ºC), with multi- channel switch, On/Off Switch, Mains Indicator.
2	Refrigeration Test Rigs	Hermitically Sealed Compressor (Capacity 0.5 Ton), Air Cooled Condenser (Capacity 0.5 Ton), Condenser Cooling Fan (Capacity 1/15 HP), Rotameter (1 No.), Refrigerant (R 134A), Hand Shut off Valves (3/8.&¼.), Filter Drier (DM 50 3/8), Electronic Energy Meters 1No., Pressure Gauges for Low and High Pressure (Capacity 0-300psi 1 No. each), Digital Temperature Indicators (0 to 199.9 deg. C minimum 12 Channels)
3	Thermal Conductivity Of Metal Rod	Metal rod (Copper Total length of the metal bar 400 mm, Effective length 320 mm, Diameter of the Metal rod 35 mm, Insulation (Chalk powder),Distance between two consecutive thermocouple 60 mm (T1 to T5), Radial distance of the thermocouple in the insulating Shell Inner radians ri = 42.5 mm + (35/2), Outer radians ro = 55 mm+ (35/2).
4	Natural Convection (Pin Fin) Test Rigs.	Length of the pin fin 120mm, Diameter of the pin fin 13mm, Diameter of the orifice 30mm, Diameter of the pipe 50mm, Coefficient of discharge 0.64, Thermal conductivity of fin material 110

		W/mK, Duct size 150 mm x 100mm, Distance between each thermocouple on pin fin 20 mm.

12. LEARNING WEBSITE & SOFTWARE

a. http://www.webelements.com
b. http://www.wikipedia.com/thermal_systtem
c. http://www.howstuffworks.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Correlate the theoretical knowledge with practical aspects of systems, surrounding and boundaries of work producing and work absorbing devices like condenser, air compressor, gas turbine, engine etc.	3	-	1	-	1	-	-	-	-	3	2	2
2	Calculate efficiency of power cycles.	3	-	2	-	2	2	1	-	-	3	-	-
3	Locate and identify various parts of given work absorbing and work producing system which used to improve their efficiency.	3	-	3	-	2	2	1	-	-	3	1	1
4	Describe the construction and working of gas turbine and compare different methods used to improve the efficiency viz. regeneration, inter-	3	-	3	-	2	2	1	-	-	3	1	1

	cooling and reheating.												
5	Justify the need of design of given heat exchanger as per application.	3	-	3	-	-	1	-	-	-	3	2	2
6	Locate various parts of refrigeration system and trace the flow of refrigerant through entire system.	3	-	3	-	2	3	2	-	-	3	2	2

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- **BASICS OF ELECTRICAL ENGINEERING AND ELECTRONICS**

COURSE CODE **6R203**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Mechanical	Third

1. RATIONALE

This course is intended to help the students to get clear idea of fundamentals of electrical and electronic components and develop practical skills in using various types of components employed in electrical & electronic industries. More over this course is intended to develop skills of testing electrical and electronics components as well as devices that will be really needed for the project and setting up of many experiments in other basic and applied technology courses.

COMPETENCY

At the end of studying this course students will be able to

"Measure and use various electrical machines /electronic instrument by studying fundamentals"

2. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE @ (PR/OR)	PA (TW)	150
4	-	2	6	80	20	--	50	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; PA-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal,~ Online examination.

3. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1) Identify AC and DC supply
2) Apply Faraday's law, Lenz's law, Fleming's right hand rule
3) Select a motor for a given application.
4) Identify and test different electronic components.
5) Use principles of electronic circuit operations and its applications
6) Compare working of different types of power supplies

4.DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I AC and DC Fundamentals	1a. Identify AC and DC supply. 1b. Determine the resistance of material. 1c. Derive the equation for series and parallel connection of resistance. 1d. Identify the commonly 1e. Used components used in 1f. Electrical engineering. 1g. Calculate electricity bill.	1.1 Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. 1.2 Laws of resistance, resistivity, 1.3 Concept of AC and DC 1.4 Ohms law 1.5 Series and parallel combination of resistance 1.6 Kirchhoff's laws 1.7 Specifications of commonly used electrical appliances, calculation of electricity bill. 1.8 (Simple numerical). 1.9 Principle of generating an 1.10 Alternating voltage 1.11 Definition of Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value and Power Factor. 1.12 Concept of power Triangle 1.13 Advantages of three phase over single phase
Unit - II Magnetism & Electromagnetic Induction	2a. Understand the terms related to magnetism 2b. Compare electric circuit and magnetic circuit. 2c. Identify the laws applicable to different machine.	2.1 Flux, flux density, magnetic field strength, mmf, reluctance, permeability. 2.2 Comparison between electric and magnetic circuits. 2.3 Faraday's laws of electromagnetic induction, Lenz's law, Fleming's right hand rule for Generators, Fleming's left hand rule for Motors.

Unit - III Electrical machines	3a. Select suitable type of transformer for a given circuit 3b. Compare squirrel cage and slip ring induction motor. 3c. Select a motor according to application	3.1 Construction, working and classification of transformer 3.2 Significance of Emf equation (no derivation) Voltage ratio, current ratio and transformation ratio 3.3 Three phase induction motor Construction, types, principle of working and applications 3.4 Alternator: - construction and working principle and application. 3.5 Single phase Induction motors: Construction, , principle of operation and applications of – a) Split phase induction motor b) Capacitor start capacitor run induction motor 3.6 Universal motor: Construction, principle of operation and applications. 3.7 Circuit diagram of different DC motor and its application.
Unit - IV Electronic Devices	4a. Explain the working of Light Emitting Diode ,Photo diode, LDR, Photovoltaic cell, varactor diode , Point contact diode. 4b. Explain the working of Bipolar Junction Transistor (BJT), Field Effect Transistor (FET) - JFET & MOSFET, Uni-junction Transistor (UJT), power devices – DIAC, TRIAC, and SCR. 4c. Explain the working of Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display(LCD), opto –coupler, thermistor-NTC,PTC	4.1 1Introduction to electronic devices, their symbols, principle of working and testing procedure – Diode, Zener diode, Power diode, Varactor diode, 4.2 Bipolar Junction Transistor (BJT), Field Effect Transistor(FET) - JFET & MOSFET, Uni-junction Transistor(UJT), power devices – DIAC,TRIAC, SCR, 4.3 Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display(LCD), opto–coupler, thermistor-NTC,PTC

Unit - V Power supplies	5a. Differentiate the working of half and full wave bridge rectifier along with sketches. 5b. State and explain principle of operation of regulated and unregulated power supply. 5c. Compare Different types of UPS.	5.1 Circuit diagram and operation- Half wave, full wave & bridge rectifier. Filters – L, C, L-C, π filter 5.2 Concept of unregulated power supply, regulated power supply- line regulation & load regulation. 5.3 Principle of operation, block diagram and application of shunt regulated power supply, series regulated power supply, switch mode power supply (SMPS), 3 pin IC regulated, IC 723 adjustable power supply. 5.4 Block diagram of UPS, Concept of online and off line UPS.
Unit – VI Transistor	6a. Compare working of CB, CE and CC AMP 6b. Compare and contrast 6c. Different types of Power amplifiers. 6d. Identify oscillators and their usage in different applications.	6.1 Transistor as a switch and amplifier, single stage transistor amplifier CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application. 6.2 Power amplifier- class A, class B, class C, class AB, their comparison on operating point, conduction cycle, efficiency, application.(No circuits expected) 6.3 Oscillator – Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator.

4. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	AC and DC Fundamentals	13	4	8	4	16
II	Magnetism & Electromagnetic Induction	08	2	4	2	08
III	Electrical machines	11	2	8	6	16
IV	Electronics Devices	12	4	8	4	16

V	Power supplies	09	2	4	2	08
VI	Transistors	11	2	8	6	16
	Total	64	16	40	24	80

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

5. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	**Unit No.**	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Appx. Hrs. required**
		ELECTRICAL	
1	I	A) Observe your electrical laboratory and identify the major equipment's with their ratings. B) Prepare charts of electrical safety and understand operation of fire extinguisher. C) Use electrical tools such as pliers, screw driver, insulation cutter, tester etc.	02
2	I	Verify ohms law	02
3	I	Verify Kirchhoff's Voltage Law.	02
4	I	Verify Kirchhoff's current Law	02
5	III	Calculate transformation ratio of a given transformer.	02
6	III	Start and reverse of three phase induction motor.	04
7	III	Start and reverse of Single phase induction motor	02
		ELECTRONICS	
8	IV	Plot the V-I Characteristic of PN Junction diode.	02

9	IV	Obtain the V-I Characteristic of Zener diode	02
10	IV	Obtain the V-I Characteristic of Light emitting diode.	02
11	V	Test half wave rectifier using CRO and measure PIV of diode	02
12	V	Test full wave rectifier using CRO and measure PIV of diode	02
13	V	Test full wave bridge rectifier with C- filter using CRO	02
14	VI	Obtain input and output characteristics and calculate gain of CE amplifier circuit	02
15	VI	Obtain input and output characteristics and calculate gain of CB amplifier circuit	02
Total			**32**

6. SUGGESTED STUDENTS ACTIVITIES

1. Make a switch board using indicator, fuse, switches, plug pin socket and regulator. Then operate lamp and fan load.
2. Identify and select various measuring instruments as per required range.
3. Calculate electricity bill for student's hostel.
4. Write the specifications of appliances used at home.
5. See the videos showing working of different electrical machines and power generation
6. Prepare journals based on practical performed in laboratory.
7. Find Specifications and package of Diode, Transistor, etc. Prepare chart for characteristic of various electronics components..

7. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

1. Improved Lecture methods-
2. Q & A technique.
3. Demonstration
4. Seminars
5. Activity based learning.
6. Arrange visit to power station / Generating plant.

7. Motivate students to observe different types of electrical loads around them.
8. Arrange visit to Electronics industry

8. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Electrical Technology Vol-1	Theraja, B. L.	S. Chand & Co. Ltd., 2011 or latest edition
2	Basic Electrical Engineering	V.N.Mittle	Tata McGraw-Hill latest edition.
3	Principles of Electrical Engineering	Gupta, B.R.	S.K. Kataria,2012 or latest edition
4	Basic Electrical Engineering	Rao, Uma. K.	Pearson Education, India, 2012 or latest edition
5	Basic Electrical Engineering	Ananda Murthy, R. S.	Pearson Education, India,2011 or latest edition
6	A Course in Electrical Technology Vol. I	Gupta ,J.B.	S.K. Kataria & Sons, 2012 or latest edition
7	Electrical Technology Vol-2	Theraja, B. L.	S. Chand & Co. Ltd., 2011 or latest edition
8	Applied electronics	R S Sedha	(S Chand & Company)
9	Electronic Devices and Circuit Theory	Boylestad Robert	Pearson, 2007 or latest
10	Electronic devices and Circuits	Millman Halkias	MGH New Delhi latest edition

9. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. Ammeter (0-5A)
2. Voltmeter (0-150/300)
3. Millimeter
4. Rheostats (0-50/90/250/350 ohm)

For Electronics:

1. Function Generator
2. Multimeter
3. D.C. Power Supply
4. Variac
5. Cathode Ray Oscilloscope
6. Digital Storage Oscilloscope

10. LEARNING WEBSITE & SOFTWARE

i. www.allaboutcircuits.com/vol_1/chpt_ml
ii. http://openbookproject.net/electricCircml
iii. www.kpsec.freeuk.com
iv. www.howstuffwork/
v. www.nptel/electrical.com

For Electronics:

i.www.nptel.iitm.ac.in
ii.www.youtube.com. (lectures on Basic electronics)
iii.www.howstuffworks.com
iv.www.alldatasheet.com
v. Electronics Work bench

11. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

SNo	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify AC and DC supply	2	-	-	1	2	-	1	-	-	1	-	-
2	Apply Faraday's law, Lenz's law, Fleming's right hand rule	3	2	2	1	-	-	-	-	1	3	2	-
3	Select a motor for a given application.	1	1	-	-	2	-	2	-	2	3	-	-
4	Identify and test different electronic	1	2	2	2	2	-	-	2	2	3	2	1

	components												
5	Use principles of electronic circuit operations and its applications	2	2	2	3	1	-	2	1	-	2	-	2
6	Compare working of different types of power supplies	-	1	-	-	2	-	-	-	-	1	-	-

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	A. A. Ghate	Lecturer in Electrical Engineering, G.P. Aurangabad
2	A.D. Dabhade	Lecturer in Electronics Engineering, G.P. Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- ENTREPRENEURSHIP DEVELOPMENT

COURSE CODE 6G306

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
All Programs	Third

1. RATIONALE

In the post liberalization era significant growth in industrial sector has led to creation of huge opportunities in manufacturing and service sector. In such a scenario especially in Indian contest it has led to innumerable opportunities for first generation entrepreneurs on a large scale. Therefore it is expected that engineers need to be developed for manufacturing, service sector and entrepreneurship development. This course, which represents Allied level of courses, aims at imparting entrepreneurial skills amongst engineers of all disciplines.

2. COMPETENCY

At the end of studying this course students will be able to

"Design a project proposal for an enterprise"

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE @ (PR/OR)	PA (TW)	50
2	-	2	4	--	--	--	50	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal,~ Online examination.

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -.

1 Apply business/enterprise principals and characteristics.
2 Design information and supporting system related to start a business.
3 Estimate and record financial requirements.
4 Develop detailed project report.
5 Use various software related to business.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I Basic Concepts of Entrepreneur	1a. Describe Entrepreneur. 1b. Identify Risk Use Creative skills 1c. Describe Risk Situation. 1d. Generate Business Idea Methods and techniques to generate Business. 1e. Plan for Transforming Ideas in to opportunities. 1f. Carryout of SWOT Analysis.	**Basic Concepts** of Entrepreneur 1.1. Concept, Classification & Characteristics of Entrepreneur. Creativity and Risk taking, Concept of Creativity & Qualities of Creative person. Risk Situation, Types of risk & risk takers. 1.2 Business Idea Methods and techniques to generate business idea. 1.3 Transforming Ideas in to opportunities- transformation involves Assessment of idea & Feasibility of opportunity, 1.4 SWOT Analysis.

Unit– II **Information And Support Systems**	2a. Use Information data for business. 2b. Information related to support system. 2c. Lay down the Procedures and related to Information. 2d. Identify Govt. Support Systems related to EDP. 2e. Explore subsidies to entrepreneur.	2.1Information Needed and Their Sources. Information related to project, Information related to support system, Information related to Procedures and formalities. 2.2 Support Systems: • Small Scale Business Planning, Requirements. • Govt. & Institutional Agencies, Formalities • Statutory Requirements and Agencies. Government Support and subsidies to entrepreneur.
Unit– III **Market Assessment**	3a Undertake Market survey. 3b Use Marketing skills and Survey. 3c Assess market for business opportunities.	**Market Assessment** 3.1 Marketing -Concept and Importance 3.2 Market Identification, Survey Key components. (Market Segmentation) 3.3 Market Assessment.
Unit– IV **Business Finance & Accounts**	4a. Determine product cost. 4b. Analyze for breakeven of business proposal. 4c. Maintain Business finance and accounts.	**Business Finance & Accounts** **4.1 Business Finance** • Cost of Project • Sources of Finance • Assessment of working capital • Product costing • Profitability • Break Even Analysis • Financial Ratios and Significance 4.2 **Business Account** Accounting Principles, Methodology • Book Keeping • Financial Statements • Concept of Audit, • Trial Balance

		Balance Sheet
Unit - V **Business Plan & Project Report**	5a. Prepare Business proposal. 5b. Undertake project appraisal. 5c. Undertake cost benefit analysis. Cost benefits analysis.	**Business Plan & Project Report** 5.1 Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost 5.2 **Project Report** 1) Meaning and Importance 2) Components of project report/profile(Give list) 5.3 **Project Appraisal** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis.
Unit – VI **Enterprise Management And Modern Trends**	6a. Manage resources. 6b. Prepare plan for productivity. 6c. Assure Quality. 6d. Explore Govt facilities (Industrial zones and SEZ.) 6e. Explore E-Commerce avenues for business.	**Enterprise Management And Modern Trends** 6.1 Enterprise Management: - 1) Essential roles of Entrepreneur in managing enterprise 2) Product Cycle: Concept And Importance 3) Probable Causes Of Sickness 4) Quality Assurance, Importance of Quality, Importance of testing 5) Industrial zones and SEZ. 6.2 E-Commerce, Concept and process. 6.3 Global Entrepreneur: role and opportunities.
Unit – VII **INTRODUCTION**	7a.Use business related software's. 7b. Survey Software's used in Mall , industries. 7c. Identify Software's	**INTRODUCTION BUSSINESS** **RELATED SOFTWARES** 7.1 Software's used in Mall.

BUSSINESS **RELATED SOFTWARES**	used For accounting.	7.2 Software's used in Medical shops. 7.3 Software's used in industrial stores such as SAP, ERP. 7.4 Software's used for accounting such as FICO, FINNACLE

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basic Concepts of Entrepreneur.	04	NA	NA	NA	NA
II	Information And Support Systems	05	NA	NA	NA	NA
III	Market Assessment	05	NA	NA	NA	NA
IV	Business Finance & Accounts	05	NA	NA	NA	NA
V	Business Plan & Project Report	05	NA	NA	NA	NA
VI	Enterprise Management And Modern Trends	04	NA	NA	NA	NA
VII	Introduction business related software's	04	NA	NA	NA	NA
	Total	**32**	NA	NA	NA	NA

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	**Unit No.**	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Approx. Hrs. required**
1	I	Literature survey of Financial Banks for Industries– MSFC/IDBI/MSSIDC/CIDBI/MSME/DIC/ ROLE OF DIFFERENT COMMERCIAL BANKS etc.	04

2	II	Administration of readymade tools like questionnaires, opinionative, Interview schedule for product identification purpose (decision making process)	04
3	III	Development of "Business Ideas". Take any product and develop the business idea for it.	04
4	IV	Visit to MCED/MITCON- going through the product related library.	04
5	VI	Preparation of Preliminary / Detailed project report in the formats recommended by MCED/MITCON Prepare project report and study its feasibility.	04
6	VI	At least one case study of successful entrepreneur.	04
7	---	Assess yourself-are you an entrepreneur?	04
Total			**28**

8. SUGGESTED STUDENTS ACTIVITIES

1. Prepare journals based on assignments.
2. Carry out Literature survey of Financial Banks for Industries.
3. Analyze the specifications, costs, quality and availability for various types of engineering components and find the business opportunity for it.
4. Interact with supplier/trader and discuss about business opportunities available in market.
5. Designing software for requirements to start business or similar type of issues. .
6. preparing project report for any product to be manufactured.
7. Search online PPT's, PDF's, video's on the design and software's for business.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

1. Group discussion among students.
2. Arrange visits to industries and show various industrial jobs.
3. Motivate students to use internet and collect name, addresses, catalogues, rates, specifications of institutes and industries working in the area of business promotions.
4. Arrange expert lecture on various opportunities in business.

10. SUGGESTED LEARNING RESOURCE

Sr.No.	Title of Book	Author	Publication
1	Entrepreneurship Development	----	NITTTR, Bhopal
2	The Seven Business Crisis& How to Beat them	V.G.Patel	S.Chand and Co. New Delhi
3	A handbook of New Entrepreneurs	P.C.Jain	,Dhanpat Rai and Sons
4	Entrepreneurship development	E.Gorden, K. Natrajan	Charotar Publication House
5	New Initiatives in Entrepreneurship Education And training	Gautam Jain, Debmuni Gupta	Tata Mc- Graw Hill
6	Entrepreneurship Theory and Practice	J.S.Saini,B.S.Rathore	Tata Mc- Graw Hill
7	Enterpreneurship Development and management	A.K.Singh	Laxmi Publications
8	The Beer mat Entrepreneur	South on D F	Pearson Education limited

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :

Computers for Practical's with internet facility
1. Software's used in Mall.
2. Software's used in Medical shops.
3. Software's used in industrial stores such as SAP, ERP.
4. Software's used for accounting such as FICO, FINNACLE.

12. LEARNING WEBSITE & SOFTWARE

i. http://www. product-list. php
ii. http://www.SAP.com/products/faro-software
iii. http://www.ERP.com

iv. http://www.fico.com
v. http://finnacle.com
vi. Visit www.ediindia.org.
vii. http://www.project reports.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	No. of hours allocated in curriculum
CO 1	Observe different characteristics of business.	3	3					2		3					6
CO 2	Apply and use different information and supporting system related to business.	3	3					3		3					8
CO 3	Maintain importance business finance and accounting procedures.	3	3					3		3					6
CO 4	Develop detailed project report.	3	3							3					6
CO 5	Use various software related to business.	3	3							3					6

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	Prof. A. W. Nemade	Lecturer in Mechanical Engineering, Govt. Polytechnic,Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- STRENGTH OF MATERIAL

COURSE CODE 6Q202

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Third

1. RATIONALE

Analysis and design of different machine components needs the basic understanding and application of mechanical properties of material and their behavior under different loading and stress conditions. Mechanical Engineer should be able to analyze behavior of materials and machine components under various types of loads. This course enables to understand different types of loads and corresponding effects on materials and machine components under various loading conditions so that appropriate material of suitable strength can be selected for the machine parts.The experiments to be conducted in laboratory will integrate knowledge and desired skills as regards to the behavior of components and materials.

2. COMPETENCY

At the end of studying this course students will be able to

1. Analyze structural components using different methods.
2. Investigate various structural properties of materials by conducting tests under different loading conditions.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	**-**	**2**	**5**	**80**	**20**	**-**	**50**	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Analyse structural behaviour of materials under various loading conditions.
2. Select material considering engineering properties for the given structural applications.
3. Draw shear force diagram and bending moment diagram for statically determinate beams.
4. Determine the bending and shear stresses in beams.
5. Determine direct and bending stresses due to eccentric loading.
6. Design shafts for given criteria.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit –I Simple Stress And Strain	1. Evaluate material properties under longitudinal, lateral, shear loads. 2. Describe the concept of composite section and analyze it under direct load. 3. Explain concept of various types of shear with examples. 4. Describe the concept of elastic constants with their relations. 5. Describe concept of types of load and corresponding stress.	1. Definition of rigid, elastic and plastic bodies. Definition of stress, strain, elasticity, Hook's law, elastic limit, modulus of elasticity. SI units. 2. Standard Stress-strain curve for mild steel and HYSD bar, Yield stress/ Proof stress, Ultimate stress, breaking stress and percentage elongation, working stress. 3. Deformation of bars of uniform and stepped cross sections under axial load/ forces applied at intermediate sections 4. Composite sections under axial load, modular ratio, equivalent area. 5. Longitudinal and Lateral strain, Poisson's ratio, biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus. 6. Shear stress and strain, modulus of rigidity, simple and complementary shear stress. Concept of single shear and double shear, punching shear 7. Relation between modulus of elasticity, modulus of rigidity and

		bulk modulus(without derivation) 8. Concept of gradual, sudden and impact load and corresponding stress development.(No derivation of stress formulae & no numerical)
Unit– II Moment Of Inertia	1. Compute Moment of Inertia, polar moment of inertia, section modulus of symmetrical and unsymmetrical sections	1. Definition, moment of inertia (M.I.) of plane lamina, radius of gyration, section modulus, parallel and perpendicular axes theorems (without derivation), Formulae for M.I. of rectangle, circle, semi circle, quarter circle and triangle section (without derivation). 2. M.I. of symmetrical and Unsymmetrical I-section, channel section, T-section, angle section & Hollow sections and built up section consisting of I section, channel sections, Angle sections with cover plates about centroidal axes and/or about any other reference axis. 3. Polar Moment of Inertia of solid circular sections.
Unit– III Shear Force And Bending Moment Diagram	1. Calculate shear force and bending moment at desired points in statically determinate beam. 2. Draw Shear Force & Bending Moment Diagram for astatically determinate beam,, locating point of contra shear and contra flexure.	1. Statically determinate beam like Cantilever , Simply Supported & Over Hang Beam 2. Shear Force and Bending Moment, Relation between load, shear force and bending moment(without derivation) 3. Sagging & Hogging Bending Moment and its importance 4. Point of Contra-shear, point of contra-flexure & their importance. 5. S.F & B.M Diagram for Cantilever, Simply Supported & over hang beam subjected point loads, uniformly distributed loads . Point of contra shear, point of contra flexure.
Unit– IV Bending And Shear Stresses In Beam	1. Apply Bending Theory. 2. Identify nature of bending stresses, Determine bending stresses and shear stresses at various locations in the beam. 3. Plot bending stress and shear	1. Concept of pure bending, Bending of different types of beams (elastic curves) and development of bending stresses and their nature, neutral axis. 2. Theory of simple bending,

	stress distribution diagram. 4. Design section of beam from flexural strength and shear strength.	assumptions,, flexural formula with meaning of all terms(without derivation) , section modulus, bending stress distribution diagram, moment of resistance.(No numerical) 3. Shear stress equation (without derivation), 4. Meaning of term used in equation, Relation between maximum and average shear stress for rectangular and circular beam sections. 5. Shear stress distribution for solid and hollow Square, Rectangular, circular sections, Angle Section, Channel section, I-Section, T sections. Simple numerical problems based on shear equation.
Unit– V Direct And Bending Stresses	1. Describe concept of eccentric load and its effect. 2. Determine resultant stresses due to eccentric load 3. Plot resultant stress distribution for eccentric load	1. Concept of direct & eccentric load, effects of eccentric load. 2. Introduction of flexural formula(without derivation), Concept of Bending stress(No numerical flexural formula). 3. Members subjected to eccentric load with eccentricity about one principle axis only, maximum and minimum stress, resultant stress distribution diagram 4. Condition for no tension, middle third rule, core of the section and limit of eccentricities for rectangular and circular sections
Unit– VI TORSION	1. Describe concept of torsion. 2. Determine stress, angle of twist due to a torque and section of shaft for given conditions. 3. Determine power transmitted by the shaft..	1. Theory of pure torsion, assumptions, torsion equation with meaning of all terms (without derivation), stress distribution across the shaft. 2. Design of solid and hollow shaft. 3. Power transmitted by a shaft.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
I	Simple Stress and strain	12	04	04	08	16
II	Moment of Inertia	06	02	02	08	12
III	Shear force and bending moment diagram	08	02	04	10	16
IV	Bending and shear stresses in beam	06	02	04	06	12
V	Direct and bending stresses	08	02	02	08	12
VI	Torsion	08	02	02	08	12

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

(any ten practical's * marked practical are compulsory)

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	I	Demonstrate the operation of universal testing machine and compression testing machine by taking trial on sample test pieces.	02*
2	I	Perform tension test on mild steel as per IS432-1:1982	04*
3	I	Perform tension test on Tor steel as per IS1786:2008	02
4	I	Conduct Izod and Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS1757(Charpy),1598(Izod)	04*
5	V	Conduct Flexural test on timber beam on rectangular section in both orientation as per IS2408:1963	02
6	I	Conduct compression test on three metals (with b/d ratio=1)	02

7	I	Perform Single Shear and double shear test on any two metals eg. Mild steel/ brass/aluminum/copper / cast iron etc as per IS 5242:1979	02
8	I	Perform Rockwell Hardness test on three metals as per IS	02*
9	I	Perform Brinell Hardness test on three metals as per IS 1500:2005	02
10	I	Carry out Compression test on timber section along the grain and across the grain as per IS2408:1963	02
11	VI	Perform torsion test on mild steel	02*
12	III	Drawing of Shear force and Bending Moment diagrams of cantilever, simply supported and overhanging beams for different types of loads two problems on each type of beam	06*
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Compare stability of different geometric shapes.
b. Survey the market and prepare list of various type of structural steel sections commonly used..
c. Collect the data of beams from field situations and correlate it with SFD and BMD numerical
d. Collect the data of various machine components subjected to tension, compression, shear, bending and combination of these.
e. Collect at least three Course question papers (MSBTE or Institute) and their model answers.
f. Draw SFD and BMD using free software.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

i. Arrange visits to industries and tool rooms to demonstrate tool manufacturing procedure for various tools.

ii. Motivate students to use internet and collect name, addresses, catalogues, rates, specifications of institutes and industries working in the area of tooling.
iii. Arrange expert lecture on various opportunities in tool design & manufacturing area.

10. SUGGESTED LEARNING RESOURCE

S.No.	Title of Book	Author	Publication
1	Strength of Materials	R. K. Rajput	S Chand & Co. Ltd. ISBN 978-8121925945
2	Strength of Materials	R. S. Khurmi.	S Chand & Co. Ltd. ISBN 978-8121928229
3	Strength of Materials	S. Ramamurtham.	Dhanpat Rai & sons ISBN 9788187433545
4	Mechanics of Structure Vol 1	S. B. Junnarkar and H. J. Shah	Charotar Publishing House Pvt. Ltd. ISBN 978-9380358659
5	Strength of Materials	Ratan S. S.	Tata McGraw Hill Education, ISBN-9385965514

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Sr.No.	Resources with brief specification
1	**Universal Testing Machine:** Capacity - 100 tonnes. Type: Mechanical type digital, electrically Operated. Accessories: (1) Tensile test attachment for flat and round specimen up to32 mm. (2) Compression test attachment (3) Shear test attachment with sizes of bushes 5,6,8,10,12,16,20,24 mm, (4) Transverse test attachment with bending Punch,(5)Service tools,(6) Operation and maintenance manuals - 2 nos. (7)Hardness attachment

2	**Digital Extensometer:** Least count - 0.001 mm. Max. Extension = 5 mm. Single dial gauge for 30,40 mm. 60 mm, 80 mm, 100 mm, 125 mm gauge length.
3	**Rockwell Hardness Testing Machine:** 10 kgf and major loads; are 60,100,150 kgf.; Rockwell hardness scales such as HRA, HRB, HRC, etc. is obtained by using different types of indentors (Diamond / Ball); Test height x Throat is - 215 x 132 mm; Extra test height and throat of 295 x 148 mm, Machines strictly conforms to IS:1586- 2000
4	**Brinell Hardness Testing Machine:** Test loads from 500 to 3000 kgf in steps of 250kgf; The height X Throat is 380 X 200 mm; Indentation measurement by Brinell Microscope of 25 X Magnification; Special Test fixtures for odd jobs / production testing can be supplied (Optional); Computerized Brinell Impression measurement system (Optional); Manual / Optical /Computerized type Brinell Hardness testing machine are also available; Accuracy conform to IS:2281-2005 and BS:240
5	**Impact Testing Machine:**CHARPY Test Apparatus: Pendulum drop angle 140°; Pendulum effective Wt 20-25 kg; Striking velocity of pendulum 5-6 m/sec; Pendulum impact energy 300 j; Min scale graduation 2 J; Distance of axis of pendulum rotation from center of specimen to specimen hit by pendulum 815 mm. IZOD Impact Test Apparatus: Pendulum drop angle: 90°-120; Pendulum effective Wt: 20-25 kg; Striking velocity of pendulum: 3-4 m/sec; Pendulum impact energy: 168 j; Min scale graduation: 2 J; Distance of axis of pendulum rotation from center of specimen to specimen hit by pendulum : 815 mm
6	**Torsion Testing Machine:** Fixed with auto torque selector to regulate torque ranges Contains geared motor to apply torque to specimen through gearbox Attached with autographic recorder for relation between torque and angle of twist Accuracy + 1 % of the true torque Suitable For: Torsion and Twist test on diverse metal rods and flats Torque Measurement by pendulum dynamometer system
7	**Compression Testing Machine:** Digital display manual control compression testing; machine; Max. Capacity (KN): 2000 ; Measuring range: 4%-100% of FS; Relative error of reading: $\leq \pm 1\%$; Max. distance between two platen (mm): 330; Compression platen size (mm): 220×220; Max. piston stroke (mm): 0-20; Max. piston speed (mm/min): Approx. 30; Column clearance (mm): 300×200; Oil pump motor power (KW): 1.5; Whole dimensions (mm): 855*380*1435
8	Strain Gauges
9	Freeware for SF and BM diagrams

12. LEARNING WEBSITE & SOFTWARE

a. http://nptel.ac.in/courses/IIT-MADRAS/Strength_of_Materials/Pdfs/4_1.pdf
b. nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024.htm
c. en.wikipedia.org/wiki/Shear_and_moment_**diagram**
d. www.freestudy.co.uk/mech%20prin%20h2/**stress**.pdf
e. www.engineerstudent.co.uk/**stress_and_strain**.html
f. https://www.iit.edu/arc/workshops/pdfs/**Moment_Inertia**.pdf

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	Analyse structural behaviour of materials under various loading conditions.	2	2	3	-	-	-	-	-	-	1	-	-
CO2	Select material considering engineering properties for the given structural applications.	3	3	-	-	-	-	-	-	-	2	-	-
CO3	Draw shear force diagram and bending moment diagram for statically determinate beams.	2	2	-	-	-	-	-	-	-	3	-	-
CO4	Determine the bending and shear stresses in beams.	3	3	2	-	-	-	-	-	-	-	-	-
CO5	Determine direct and bending stresses due to eccentric loading.	3	3	-	-	-	-	-	-	-	-	-	-
CO6	Determine stress in the shaft due to torque and power transmission.	1	3	2	-	-	-	-	-	-	-	-	-

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute

1	R. T. Aghao	Sr. Lecturer in Applied Mechanics Department ,G.P.Aurangabad
2	Narendra R. Bansode	Sr. Lecturer in Applied Mechanics Department ,G.P.Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE Materials

COURSE CODE 6A203

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Third

1. 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.

2. COMPETENCY

At the end of studying this course students will be able to

1. Identify material of given Parts of Motor vehicle.
2. Analyze failure of given parts of Motor vehicle.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying 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

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Introduction To 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 Fabrication requirements, Service requirements, Economic requirements 1.2 Classification of materials used in Automotive: Metals – Ferrous and nonferrous, Ceramics, Organic 1.3 Selection of Auto materials for engineering design. 1.4 Properties of Auto materials like, hardness, Ductility, malleability, Stiffness, Formability, Machinability, Weld ability, Cast ability, Resilience, Creep, Fatigue, Wear resistance, Red hardness, Toughness, Embed ability.
2. Auto Materials – Ferrous	1. Identify the types of ferrous auto materials. 2. State the advantages of ferrous auto materials. 3. Suggest Auto materials for the frame. 4. Justify, the use of ferrous materials for automobiles.	2.1 Classification of ferrous metals. 2.2 Cast Iron – Types gray cost iron, White Cast iron, malleable cast iron, nodular cast iron, their characteristics & application. 2.3 Steels – Types plain carbon steel, composition, and application. IRON carbon dia. & TTT diagram Heat treat & surface having of steel, Annealing, Normalizing, hardening & tempering, case-carburizing, nitrating, inducting, flame hardness. Effect of alloying elements like N1, Cr, Si, Mo, W on the properties of steels. 2.4 Tool steel: General Properties, Classification, Heat treatment of tools steel & application. 2.5 Stainless steel; General properties, classification and application.

		2.6 Heat resistance steel: General properties & application.
3. Auto Materials – Nonferrous	1 Identify the types of Non-ferrous auto materials. 2 State the advantages of Non-ferrous auto materials. 3 Suggest Auto materials for the frame. 4 Justify, the use of nonferrous materials for automobiles.	3.1 Copper and its alloys – Brass, Bronze, Gun metal, babits, their properties, composition & application. 3.2 Aluminum & its alloys their properties & application. 3.3 Magnesium & its alloys their properties & application. 3.4 Lead its Properties , composition & application
4.Auto Materials – Ceramics	1. Enlist and describe Common ceramic Materials 2. State the applications of Ceramic Materials 3. List the surface hardening processes.	4.1 Common ceramic materials used in automotive. (ZrO2, Corel rite, Al2O3,SIO2,SIO2,Glasses, WC-CO cermets, Glass ceramics) 4.2 Application of ceramic materials in Automotive. 4.3 Properties of ceramic material. 4.4 Synthesis & Processing of ceramic powders. 4.5 Glass ceramics – TSG, LSG.
5. Automobile Materials – Rubbers, Plastics & Polymers:	1. Enlist and describe Plastics and Polymers Materials 2. State the applications of Plastics and Polymers	5.1 Plastics and Polymers as a substitute. 5.2 Characteristics, Properties and application of the polymeric materials like thermosetting plastics, thermoplastics, fiber, rubber and composite materials. 5.3 Abbreviation, chemical names and trade names. 5.4 Rubbers – types, properties and applications
6.Auto Materials – Fuels, Lubricant & Paints	1. State the applications of Auto. Materials ,fuels ,Lubricants & Paints 2. Justify, the use of Lubricants, Lacquer etc for automobiles.	6.1 Requirements of ideal fuel, lubrication 6.2 Fossil fuels – Petrol, diesel, heavy oil. 6.3 Bio fuels – Bio CNG, LPG diesel, methanol, Ethanol. 6.4 Liquid lubricant – Multi grade, Mono grade. 6.5 Solid lubricant - Graphite lithium grease. 6.6 Lacquer – Primer. Surface, Putty.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

UNIT NO	TITLE OF UNIT	TEACHING HOURS	DISTRIBUTION OF MARKS			
			R	U	A	TOTAL MARKS
1	Introduction To Auto Materials	06	02	04	04	10
2	Auto Materials – Ferrous	10	04	10	04	18
3	Auto Materials – Nonferrous	08	04	04	04	12
4	Auto Materials – Ceramics	06	02	04	04	10
5	Automobile Materials – Rubbers, Plastics & Polymers:	10	04	10	04	18
6	Auto Materials – Fuels, Lubricant & Paints	08	04	04	04	12
	Total	48	20	36	24	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Sample collection & report writing	4
2	03	Observing ready micro structure & interpretation.	4
3	04	Visit to heat treatment plant & report writing on Annealing, Normalizing, Case Carburizing, Surface treatment, Tempering, Hardening	4
4	06	Testing of fuel – Petrol, diesel, flash point, fire point, power, cloud point.	4
5	06	Testing of lubrications – Viscosity, viscosity index, penetration test.	2
6	05	Study of various plastic body parts.	2
7	04	Study of rubber glazing.	2
8	04	Survey of various types of glasses using in motor vehicle.	2
9	03	Study & reporting about mixing rack.	2
10	03	Survey of alloy steels.	2
11	04	Study of plain bearing material.	2
12	03	Study of gear materials.	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of

various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a) Collect market rates for various automobile engineering materials

b) Collect minimum 10 different component of different Material from Automobile Service Industry.
c) Collect information from Various Automobile Industries about Advance materials used in components.
d) Visit to Metallurgical Industry / Lab for collecting information of different material testing procedure such as hardness measurement, Spectro analysis and preparation of mounting for micro structural observation, Specimen preparation.
e) Collect the application based images of any component of automobile engineering.
f) Collect application based, working based model or actual equipment based videos of any component of automobile engineering.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Materials Science and Processes	S Hajra Choudhury, Ak Hajra Choudhury	Indian Book Distributing Co,
2.	Material Science & Metallurgy	O.P.Khanna	Dhanpat Rai & Sons

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** : NIL

12. LEARNING WEBSITE & SOFTWARE

a. http://www.wikipedia.com/heat_engine

b. http://www.howstuffworks.com
c. http://www.webelements.com
d. http://onlinecourses.nptel.ac.in

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Analyze automobile material properties for different applications	-	3	-	2	2	-	-	-	-	-	-	3
2	Select automobile materials for motor vehicle and its components.	-	3	-		-	-	-	-	-	-	-	2
3	Identify various heat treatment processes.	-	3	-	2	-	-	-	-	-	-	-	3
4	Prepare a report on auto materials	-	3	-	2	-	-	-	-	-	-	-	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE MECHANISM

COURSE CODE 6A204

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Third

1. 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, analyze and interpret various mechanisms and elements of machines. Hence, it will be helpful for them to understand detail information of relative motions and the functional aspect of mechanism used in the automobile in a better way. This subject imparts the kinematics involved in different machine elements and mechanisms like four bar mechanism, cam-follower, power transmission , suspension, Brake, clutches, flywheel & Governor, etc. Detailed knowledge of these aspects with deep insight into the practical applications develops a professional confidence in them to become successful Engineer.

2. COMPETENCY

At the end of studying this course students will be able to

1. Apply basics of Kinematics for different applications in automobile elements.
2. Develop the skills and professional confidence to operate the machine
3. Utilize basic knowledge related to machine and mechanism to develop new one.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	125
3	--	2	5	80	20	--	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Understand the construction, working and application of various mechanisms and inversions of mechanism in Automobile.
2. Analyze different mechanisms by finding the velocities & accelerations of mechanisms with analytical and graphical methods
3. Construct cam profile & appreciate concept of pressure angle.
4. Select and analyze Suitable Drives and Mechanisms for a particular application.
5. Identify and analyze various mechanisms used in suspension and braking system, also Calculate braking force, torque and power lost in friction in shoe and band brake.
6. Describe Principle, Construction, Working of governors, and analyze mechanism used in governor.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Fundamentals And Types Of Mechanisms	1 To understand and identify various terms related to mechanisms 2 To understand the construction, working and the applications of various inversions of mechanism in Automobile.	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. Inversions of Kinematic Chain. 1.2 Inversion of four bar chain, coupled wheels of Locomotive & Pentograph. 1.3 Inversion of Single Slider Crank chain- Pendulum pump, Rotary I.C. Engine mechanism 1.4 Inversion of Double Slider Crank Chain- Scotch Yoke Mechanism & Oldham's Coupling. 1.5 Common Mechanisms

		Bicycle free wheel Sprocket mechanism, Ackerman's Steering gear mechanism, wiper, universal joint.
2.Velocities And Acceleration In Mechanism	1 Determine velocity and acceleration of different links in single slider crank mechanism by analytical method. 2 Determine the velocities of various points by ICR method 3 Describe concept of relative velocity and relative acceleration. Draw velocity and acceleration diagram by relative velocity method	2.1 Linear displacement, Angular displacement. 2.2 Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter- relation between linear and angular velocity and acceleration. 2.3 Instantaneous center of rotation (ICR) method: Concept of ICR, type s of instantaneous centers, finding the velocities of various points by ICR method for slider crank mechanism and four bar mechanism. 2.4 Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding coriollis components of acceleration]. Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.
3. Cams & Followers	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, types and application of Cams and Followers. 3.2 Classification of Cams and Followers. 3.3 Different follower motions and their displacement diagrams like uniform

		velocity, SHM, uniform acceleration and Retardation. 3.4 Drawing of profile of radial cam with knife-edge and roller 3.5 follower with and Without offset with reciprocating motion (graphical method)
4.Power Transmission	1. Describe classification of Drives and selection of materials for various applications of drives. 2. Select Suitable Drives and Mechanisms for a particular application. 3. Calculate various quantities like velocity ratio, belt tensions, slip, angle of contact, power transmitted in belt drives and gear drives. 4. Calculate torque and power lost in friction for bearings.	4.1 **Types of Drives** – Belt, Chain, Rope, Gear drives & their comparison. 4.2 **Belt Drives** - flat belt, V– belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical) 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. Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train, methods of lubrication, Law of gearing. 4.4 **Chain Drives** – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. 4.5 **Rope Drives** – Types, applications, advantages & limitations of Steel ropes.
5.Suspensions, Clutches, Brakes And Dynamometers,	1. Understand construction and working of different mechanisms used in suspensions in Automobiles. 2. Explain construction and working of various clutch.	5.1 Suspension Solid axle suspension Adding an anti trump bar to guide a solid axle. Triangular linkages Panhard arm and lateral displacement. Straight line linkages. Watt suspension mechanisms with panhard arm. Robert

	3. Differentiate between uniform pressure and uniform wear theories. 4. Differentiate between brakes and dynamometers 5. Construction and working of various brakes and dynamometers 6. Calculate braking force, torque and power lost in friction in shoe and band brake	suspension mechanisms with panhard arm. A solid axle suspension with coil spring. A double A-arm suspension. Independent suspension. 5.2 Brakes and dynamometer- Function of brakes and dynamometer, Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake. Concept of Self Locking & Self energizing brakes. Numerical problems to find braking force and braking torque for shoe & band brake. Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. 5.3 Clutches- Uniform pressure and Uniform Wear theories. Function of Clutch and its application, Construction and working of i) Single plate clutch, Multiplate clutch, iii) Centrifugal Clutch iv) Cone clutch v) Diaphragm clutch. (Simple numerical on single and Multiplate clutch).
6.Flywheel, Governors, And Balancing	1. Understand function of flywheel and governor. 2. Classify and compare governors. Appreciate necessity of balancing. 3. Calculate balancing mass analytically and graphically. Understand causes and effects of vibrations 4. Describe the concept of balancing	6.1 **Flywheel** - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder, 4-Stroke I.C. Engine (No Numerical). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. 6.2 **Governors** - Types, concept, function and application & Terminology of Governors. 6.3 Comparison between Flywheel and Governor. 6.4 **Balancing**- Concept of balancing of single rotating mass 6.5 Analytical/Graphical methods for balancing of several masses revolving in same plane 6.6 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Fundamentals And Types Of Mechanisms	10	04	10	04	18
2	Velocities And Acceleration In Mechanism	06	02	04	04	10
3	Cams & Followers	08	02	06	04	12
4	Power Transmission	08	02	06	04	12
5	Suspensions, Clutches, Brakes And Dynamometers,	10	04	10	04	18
6	Flywheel, Governors, And Balancing	06	02	04	04	10
	Total	48	16	40	24	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Sketch & describe working of bicycle chain and Sprocket wheels mechanism.	04
2	01	Determination of velocity and acceleration by relative velocity method (four problems).	04
3	01	Determination of velocity and acceleration of piston of an I.C. engine's Slider Crank mechanism by Klein's construction, for different position of crank in between 0^0 and 360^0. Represent graphically velocity verses crank angle and acceleration verses crank angle.	04
4	03	Draw the profile of radial cam for the given motion of follower. (At least four problems)	04
5	03	Determine the radius of rotation of flyball for different speed of governor and draw a graph between radius of rotation versus speed.	04
6	04	Dismantling and assembly of mechanically operated braking mechanism for two wheelers.	04
7	04	Dismantling and assembly of multiplate clutch of two-wheeler.	04
		Total practical hours	28

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Market survey on technical specification and cost of any two engine components.
b. Seminar and report writing on any topic mention in above units by group of two students).
c. Prepare a report on industrial visit to Service or Manufacturing industry of Auto sector.
d. Mini project in the group of min. 2 and max. 5 students.
e. Poster presentation on any topic mention in above units or latest development in the field of internal combustion engine.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Mechanism Design: Analysis and Synthesis, vol.-I & Advance Mechanism Design: Analysis and Synthesis, vol.-II	- G.N. Sandor & A.G. Erdman,	Prentice Hall, Inc., New Jersey, 1984.
2.	Theory of Machines and mechanism	J.E. Shigley & J.J. Uicker,	Jr., McGraw-Hill international edition.
3.	Mechanism and Machine Theory.	J.S. Rao, R.V. Dukkipati,	Wisey Eastern limited.

4.	Theory of Machines	S.S. Ratan,	McGraw-Hill Companies.
5.	Theory of Machines.	R.S. Khurmi & J.K. Gupta,	S Chand and company ltd.
6.	Mechanism & Dynamics of machinery.	Mabie, Reinholtz,	Wiley John Wiley Publishers.
7.	Theory of machines	Ghosh – Mallik,	Affiliated East west press

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** : NIL

12. LEARNING WEBSITE & SOFTWARE

a. http://www.wikipedia.com/heat_engine
b. http://www.howstuffworks.com
c. http://www.webelements.com
d. http://onlinecourses.nptel.ac.in

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Understand the construction, working and application of various mechanisms and inversions of mechanism in Automobile.	-	3	-	2	2	-	-	-	-	-	-	3
2	Analyze different mechanisms by finding the velocities & accelerations of mechanisms with analytical and graphical methods	-	3	-		-	-	-	-	-	-	-	2
3	Construct cam profile & appreciate concept of pressure angle.	-	3	-	2	-	-	-	-	-	-	-	3

4	Select and analyze Suitable Drives and Mechanisms for a particular application.	-	3	-	2	-	-	-	-	-	-	-	3
5	Identify and analyze various mechanisms used in suspension and braking system, also Calculate braking force, torque and power lost in friction in shoe and band brake.	-	3	-	2	2	-	-	-	-	-	-	3
6	Describe Principle, Construction, Working of governors, and analyze mechanism used in governor.	-	3	-	3	3	-	-	-	-	-	-	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE **BASIC MANUFACTURING PROCESSES**

COURSE CODE **6A206**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

The diploma technicians are often come across various machining process in practice. It is therefore very important to known the fundamentals of various types of the chip forming and non chip forming processes and the tools used for the same. This will help the diploma technician to handle and improve the practical knowledge effectively. Basics of the common chip / non chip forming processes used are introduced at this course.

2. COMPETENCY

At the end of studying this course students will be able to

"Apply & Analyze various manufacturing processes."

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (PR)	PA (TW)	200
3	-	3	6	80	20	50#	50	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **;PR-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Select a machine for a given job.
2. Select a manufacturing process for a given simple job.

3. Select a set of manufacturing processes for completing a given complex job.
4. Calculate cost of a given machining.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Mechanical working of metals**	1a. Describe different hot working processes. 1b. Describe different cold working processes.	**Hot Working** 1.1 Types of Hot and cold working machines. 1.2 Hot rolling, Piercing or seamless tubing, Drawing, Deep drawing, Hot spinning, Extrusion & forging **Cold Working** 1.3 Cold rolling, Cold spinning, Cold drawing, Bending, Extrusion, squeezing, Peening shearing & blanking, embossing & stretch forging. 1.4 Machining & Manufacturing cost estimation.
Unit– II **Press and press Work**	2a. Describe different types of presses. 2b. Identify different parts of power press. 2a. Describe the different press operations.	2.1 Introduction, types of presses, 2.2 Power press parts, power press driving mechanism, press size, press tools. 2.3 Methods of punch support, methods of die support, die accessories, types of dies and operations, press guard, Types of press tools & Different press operations used in industries like- Blanking. Punching, Forming, Bending, Piercing Etc. 2.4 Machining & Manufacturing cost estimation.
Unit–III **Welding Process**	3a. Describe different welding methods. 3b. Select proper welding method for different	3.1 Definition and classification of welding. 3.2 Study of welding methods –

	materials	Arc welding, Gas welding, Resistance welding, Spot welding, butt welding, flash welding, seam welding, projection welding, thermit welding, inert gas arc welding, TIG welding, MIG welding. 3.3 Selection of welding methods for different materials such as cast steel, cast iron, carbon steel, stainless steel. Inspections, defects &remedies 3.4 Types of Welded Joints used in the Automobiles and Applications of welding process. 3.5 Machining & Manufacturing cost estimation.
Unit – IV **Pattern Making and Molding**	4a. Describe the constructions of pattern. 4b. Prepare pattern layouts. 4c. Use of different allowances. 4d. Apply colour codes. 4e. Identify the Characteristics of moulding sand. 4f. Describe testing of moulding sand.	4.1 Design consideration in pattern, pattern layout, pattern construction, 4.2 Pattern materials, selection of materials; 4.3 Allowances, master pattern, function, types, core prints unserviceable parts as pattern; core boxes, Hand tools, and their uses. 4.5 Moulding machines and their types, Moulding sand, characteristics, constituents of moulding sand, sand preparation & conditioning, sand testing equipments, core moulding, and solidification of metals. 4.6 Gravity die casting, slush casting, moulding procedure, gating risering. 4.7 Machining & Manufacturing cost estimation.

Unit– V **Rough cutting process**	5a. Describe different type of single point / Multipoint cutting cutting process. 5b. Suggest a single point / Multipoint cutting process for given job. 5c. Identify different parts of single point / multipoint cutting tool.	5.1 Introduction 5.2 Single point cutting tool processes like- turning, taper turning, facing, tapping, chamfering, boring, grooving, chamfering, thread cutting. 5.3 Multipoint cutting tool processes like- drilling, milling, parting-off, gear cutting, gear hobbing. 5.4 Advantages and limitations of Rough cutting operations and applications pertaining to industries. 5.5 Machining & Manufacturing cost estimation.
Unit– VI **Super finishing processes**	6a. Classify super finish process. 6b. Suggest super finish process for given job.	6.1 Introduction to Grinding, working principle of grinding, types of grinders, wet and dry grinding, Properties for abrasives applications of Grinding. 6.2 Working principle of Surface finishing processes like- Honing, lapping, polishing, Buffing, Tumbling, power brushing. 6.3 Super finished auto components. 6.4 Advantages and applications of super finishing processes. 6.5 Machining & Manufacturing cost estimation.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Mechanical working of metals	07	04	06	02	12

II	Press and press Work	07	02	08	02	12
III	Welding Process	10	02	08	02	12
IV	Pattern Making and Moulding	09	04	12	04	20
V	Rough cutting process	07	02	06	04	12
VI	Super finishing processes	08	02	06	04	12
	Total	48	16	46	18	80

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Prepare a simple component on press machine.	08
2	III	Produce a component by using arc welding process.	12
3	IV	Prepare a sand mould and casting for simple component.	08
4	V	Turning Plain Turning, Step Turning, Taper Turning, Grooving, Chamfering, Thread Cutting	20
Total			**48**

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

1) Prepare journal for practical's.
2) Visit to concern industries.
3) Write specifications of different machine tools observed during industrial visits.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Seminars
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

Sr No.	Title of Book	Author	Publication
1	Workshop Technology Vol. II	Hajra, Choudhary	Media promoters and publishers limited (ISBN 97881850991)
2	Workshop Technology Vol.1I	P.N.Rao	Mcgraw hill (ISBN 9781259081231)
3	Production Technology Vol. II	Khanna O.P. and Lal	Dhanpat rai publications,New Delhi
4	Hand book on production Technology	HMT	Tata Mcgraw hill (ISBN 9780070964433)
5	Workshop Technology Vol.1	Raghuwanshi,	Dhanpat rai and sons

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :

S. No.	Name of equipment	Brief specification
1.	Hacksaw	As per Workshop specification
2.	Lathe with standard and special accessories	As per Workshop specification
4	Milling machines-Vertical and Horizontal with standard accessories and indexing/dividing head.	As per Workshop specification
5	Column drilling machine	As per Workshop specification
6	Radial Drilling machine	As per Workshop specification
7	Slotting machine	As per Workshop specification
8	Planning machine	As per Workshop specification
9	Tool and cutter grinder	As per Workshop specification
10	Automats-turret and capstan.	As per Workshop specification
11	• Required cutting tools-HSS and Carbides. • Required cutting tool holders.	As per Workshop specification
12	Different molds and sands	As per Workshop specification
13	Arc welding machine	As per Workshop specification

12. LEARNING WEBSITE & SOFTWARE

a. http://nptel.iitm.ac.in/video.php?subjectId=112105126
b. http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Manuf%20Proc%20II/pdf/LM-01.pdf
c. http://www.youtube.com/watch?v=H0AyVUfl8/k&list=PLEFE7D1579523C45D
d. http://www.youtube.com/watch?v=FFzRIop5bpg&list=PL843C2A830C65E2EE
e. http://www.youtube.com/watch?v=81Fdif5e85c
f. http://www.youtube.com/watch?v=A0dTvf_Q8BA&list=PL2C105C94D2955C8B
g. http://www.youtube.com/watch?v=tDc0l9Gm8D4&list=PL3AFB507B668AF162
h. http://www.youtube.com/watch?v=THVgkBnjLq0
i. http://www.youtube.com/watch?v=6VpCBk7FahI
j. http://www.youtube.com/watch?v=7wC1u4WOV1o
k. http://www.youtube.com/watch?v=VDIoUZuTunI

l. http://www.youtube.com/watch?v=fGqc9mZS0YI
m. http://www.youtube.com/watch?v=Mn9jpqI8rao
n. http://www.youtube.com/watch?v=8SuoH5aL1SY
o. http://www.youtube.com/watch?v=xxNZSQML_ZA

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr No	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Compare different cold and hot machining process on basis of their significance.	3	3	3	3	-	-	-	2	-	-	3	-
2	Prepare simple components by press operations.	3	3	3	3	-	-	-	2	-	-	3	-
3	Perform welding operations by using relevant parameters.	3	3	3	3	-	-	-	2	-	-	3	-
4	Produce simple castings by using sand moulds.	3	3	3	3	-	-	-	2	-	-	3	-
5	Produce a given job by using different rough cutting process.	3	3	3	3	-	-	-	2	-	-	3	-
6	Produce a given job by using different super finishing process	3	3	3	3	-	-	-	2	-	-	3	-

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic,Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- TWO WHEELER TECHNOLOGY

COURSE CODE 6A506

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

There is an increased need of public transport. The public transport systems in cities and in rural area do not meet the requirement effectively. This has led to huge demand of two wheelers. Presently the two wheelers are used by a large section of society as personalized transport. In view of the growth, large employment potential in this field and the manpower required to cater to the same, this course is included as an elective course.

2. COMPETENCY

At the end of studying this course students will be able to

1. Carry out the recommended procedures of the servicing using a service manual.
2. Analyze various mechanical, electrical and electronic systems and modern Features used in two wheelers.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR/PR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Observe, compare and describe two wheelers on basis of Aerodynamics, Aesthetics and Ergonomic considerations for their merits and demerits.
2. Understand the functions of various parts of a two wheeler body.
3. Understand various systems of a two wheeler. Use various facilities available in an advanced two wheeler
4. Adjust the idling speed of two wheeler engine. Perform clutch and brake Adjustment.
5. Check parameters like tyre inflation, battery voltage, charging voltage of a two Wheeler.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit -I Frames, Body and Transmission system	1. Know various types of frames, bodies, select a suitable type of frame for particular application. 2. Compare types of clutches, gearboxes and their applications	1.1 Type of frames Single cradle frame, Double cradle frame, Tubular frame (Single Down-tube frame using the engine as a stressed member) Body- Monocoque Construction 1.2 Selection of Transmission system components ,Cable Actuated Wet Multi-disc clutch, Centrifugal clutch ,Chain drive, Belt drives with variator mechanism, Gear drive 1.3 Working of Gear box, its comparison with four wheelers
Unit-II Engines, Fuel Supply System, Lubrication System and Emission Control System	1. Understand engine features and its working 2. Understand working of Induction system, Exhaust System, Fuel 3. Supply System, Lubrication System and Emission Control System	2.1 Induction and Exhaust system Induction System 2.2 Air filter/ Air Cleaner: construction and function - Washable oiled sponge element, washable Dual foam wet type 2.3 Two Stroke Engines - Arrangement of Ports in the cylinder, Decompression Valve arrangement. 2.4 Four Stroke Engines - Overhead Valve and Overhead cam

		arrangements. Advantages of Multiple valves 2.5 Fuel supply system Gravity feed and vacuum operated system. 2.6 Down draught and horizontal/ Side draught carburettor 2.7 Carburettor functions and working under various Engine operating conditions like – Idling, Starting, accelerating, normal running. 2.8 Advantages of electronic fuel injection system 2.9 Construction and function of Exhaust system: Header pipe, Muffler Types and their application, Tail Pipe arrangement and location 2.10 Lubrication and Emission Control Systems Lubrication system, Petroil Lubrication with Separate Oil Pump for Two stroke engines. 2.11 Wet sump Pressurized Lubrication in four stroke engines 2.12 Block diagram and working of pollution control measures 2.13 Catalytic convertor, Exhaust Gas Recirculation, Positive Crankcase Ventilation
UNIT-III Steer Mechanism and Suspension System	1. Know types of front and rear suspension system and steer Mechanism System.	3.1 Handle Bar arrangement, Steer fork, Purpose of providing Caster angle 3.2 Use of Dampers/ Double acting type of shock absorbers 3.3 Use of Variable Rate coil spring, Coil in coil spring arrangement 3.4 Advantages of Mono-shock suspension system 3.5 Advantage of Gas filled shock absorber for rear end suspension
UNIT-IV Brakes, Wheels and Tyre.	1. Understand types of braking system, types of wheels and modern tyre	4.1 Drum (Mechanical Expanding Shoe type) and disc Brakes (Fixed Caliper and Floating Caliper types)

		4.2 Mechanical and Hydraulic brakes 4.3 Lever operated and pedal operated brakes 4.4 Application and criteria for selection of wheels and tyre, their specification for motorcycles, scooters, sports bike
UNIT-V Electrical System	1. Know types of ignition and other electrical systems	5.1 Ignition System Working of Condenser Discharge Ignition (CDI) system Microprocessor controlled Ignition system block diagram and working Benefits of Twin Spark Ignition system 5.2 Starting system and Charging System Kick Start and Button Start arrangements. Components of starting system and their functions: D C motor, Battery, Battery Rating for use in Button start vehicles Schematic circuit and working of charging system. Schematic diagram showing AC and DC circuits 5.3 Lighting System and accessories Specifications and Application of Head Lamp, Tail and number plate Lamp, Purpose of using LED lights in tail lamp, Turn Signal Lamp, Side Stand Indicator Lamp, High Beam Indicator Lamp, Neutral Indicator Lamp, Speedometer Lamp Horn, Mobile Charger point, Head lamp and tail lamp Reflectors used in two wheelers Dash units 5.4 Use of Speedometer (Analogy and digital), Trip meter 5.5 Use of Engine Speed indicator/ Tachometer
UNIT-VI Aerodynamics, Ergonomics, Aesthetics and Safety Aspects	1. Understand Aerodynamics, Aesthetics and Ergonomic aspects of a two wheeler	6.1 Aerodynamic Aspects Head lamp shape (Sealed beam and conventional) Tail lamp and indicator light arrangements- body enclosed and Separate Shape of

		Fuel Tank in Motorcycles 6.2 Ergonomic and Aesthetic Aspects Ergonomic Aspects Seat Arrangement for rider and pillion rider Handle bar position Floor/ Foot rest for driver and pillion rider Aesthetic Aspects Head lamp fairing of motorcycles. 6.3 Side panels for scooter/ scooterette and motorcycle Ground clearance Mud guard shape and position.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Frames, Body and Transmission system	06	04	02	04	10
2	Engines, Fuel Supply System, Lubrication System and Emission Control System	14	04	06	08	18
3	Steer Mechanism and Suspension System	06	04	04	04	12
4	Brakes, Wheels and Tyre	04	02	04	04	10
5	Electrical System	10	04	08	04	16
6	Aerodynamics, Ergonomics, Aesthetics and Safety Aspects	08	04	06	04	14
Total		48	22	30	28	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Observe and sketch the layout of a two wheeler transmission system	04

2	01	Check the following electrical / electronic components, parameters of a two wheeler CDI system components, Charging System components, Voltage at battery, specific gravity and high discharge test Use service/ operators manual for specifications.	04
3	03	Adjust idle speed of a two wheeler engine using the specified procedure. Check the Idling Emission using Exhaust Gas Analyzer and do necessary carburettor adjustments for better performance	04
4	04	Check the Ignition Timing of a two-wheeler and compare it with the Workshop/ Operators Manual Specification. Remove, observe, clean the Spark plug and adjust the gap and refit	04
5	04	Remove and refit rear wheel of a two wheeler - check the conditions of brake shoes, brake drum, bearings etc. Perform brake adjustment. Replace brake cables, brake shoes/ pads	04
6	04	Visit a Two wheeler Dealer Showroom/ Company showroom to obtain Chassis specification of a Scooter/ Motorcycle or scooterette. Share and Compare the data collected for two wheeler vehicles in the same category of vehicles (on the basis of Ground clearance, wheel base, engine power, spare wheel, claimed fuel efficiency, load carrying capacity) Prepare a report to identify the better one in the category	04
7	03	Dismantle and assemble a motorcycle clutch and perform clutch adjustment ,Replace clutch cable if required	04
8	04	Carry out lubrication and greasing of a vehicle. Engine, brake linkage, clutch linkage, fork, axle, chain and levers	04

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of

various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a) Collect market rates for various vehicle components like clutch, gear box, brake shoes, wheels etc.
b) Form chart of clutch, gear box, types of treads pattern on tyre.
c) List out common trouble shooting in Brake system.
d) List out Tyre pressure require to different vehicle.
e) Report all the salient feature of a latest two wheeler. Describe the technical and ergonomic features, if information is available. Comment on the aesthetic of the vehicle. Separate models should be considered by a group of four students.
f) Prepare troubleshooting chart for failure of a two wheeler system(Symptoms, causes and remedies)

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1	Service manuals of popular Indian Two Wheeler Vehicles.	---	---
2	Two wheelers	K.K. Ramalingam	SCITECH-I
3	Automobile Engineering	R.B. Gupta	Satya Prakashan
4	Automobile Engineering	K.K. Ramalingam	SCITECH-I

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

a. Two wheeler hydraulic post.

b. Pneumatic Line setup with tools
c. Two wheelers
d. Tools ,Equipment's , and Standard tools etc

12. LEARNING WEBSITE & SOFTWARE

a. http://www.wikipedia.com
b. http://www.howstuffworks.com
c. http://www.webelements.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Observe, compare and describe two wheelers on basis of Aerodynamics, Aesthetics and Ergonomic considerations for their merits and demerits.		3								3		3
2	Understand the functions of various parts of a two wheeler body.		3			2		3					2
3	Understand various systems of a two wheeler. Use various facilities available in an advanced two wheeler		3				3						2
4	Adjust the idling speed of two wheeler engine. Perform clutch and brake		3		2								3

	Adjustment.												
5	Check parameters like tyre inflation, battery voltage, charging voltage of a two Wheeler.		3		3								2

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- SPECIAL PURPOSE VEHICLE TECHNOLOGY

COURSE CODE 6A507

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

In the fast developing economy of India, the infrastructure development is at its peak. Earth moving machines are integral part of infrastructure development activity. India being largest market of Tractor in the world, it is necessary for automobile engineer to have full knowledge of tractor or agricultural machinery. Hence these two categories of off-highway vehicles are primarily included in special purpose vehicles. This course in Automobile Engineering will make student to understand and apply the knowledge about various system and subsystems for servicing of these vehicles.

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyse various systems and subsystems of earth moving machines and Agricultural machines**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR/PR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Observe, compare and describe Special Purpose vehicle on basis of Aesthetics and Ergonomic considerations for their merits and demerits.
2. Understand the functions of various parts of a Special Purpose vehicle.
3. Understand various systems of a Special Purpose vehicle. Use various facilities Available in an advanced Special Purpose vehicle
4. Check parameters like Hydraulics, PTO, Other related parameter etc.in Special Purpose vehicle

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
UNIT-I Earth Moving Machines – Introduction	1. Know various types of Special Purpose vehicle, select a suitable type of frame for particular application. 2. Compare types of clutches, gearboxes and their applications	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. 1.5 Related Hydraulic Actuation in Above Special Purpose Vehicle
Unit-II Tractor Dozer	1 Understand Rippers, dozers features and its working 2 Understand working of Induction system, Exhaust System, Fuel 3 Supply System, Lubrication System and Emission Control System	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. 2.3 Ripper tip selection. 2.4 Dozing & Underwater application 2.5 Dozer blade – types i.e. straight dozer, angle dozer, S' blade, 'U' blade, 'C' blade, 'A' blade, and their applications. 2.6 Track shoe construction & working. 2.7 Under carriage maintenance. 2.8 Safety precautions for Dozer operations 2.9 Related Hydraulic Actuation in Above Special Purpose Vehicle
UNIT-III Dragline (Rope Operated Excavator)	1. Know types of Dragline and other systems	3.1 Applications of dragline i.e. excavating channels, ditches, trenches, underwater soil, stripping overburden, shallow grading, general excavation, loading into hoppers, loading hauling units, sloping & grading.(simple sketches only) 3.2 Clamshell - application, capacity, bucket, construction & size 3.3 Hoe and Cranes - their working & Application. 3.4 Related Hydraulic Actuation in Above Special Purpose Vehicle
UNIT-IV Loaders & Excavators:	1 Understand types of Loaders and Excavators & their types	4.1 Crawler loader – working & attachments i.e. standard bucket, bulk handling bucket, fork lift attachment, crane attachment Stability & safety of crawler loader operations. 4.2 Wheeled loader –types i.e. back hoe & front hoe, working, capacity & output. 4.3 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. 4.4 Scraper: Block diagram, types – Towed & selfpropeller, 4.5 Motor Grader – Block diagram, constructions, application, stability & safety, capacity & outputs 4.6 Related Hydraulic Actuation in Above Special Purpose Vehicle
UNIT-V Tractor	1. Know types of tractor ,their us in specific operations ,	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 a tractor 5.8 Power tiller- Comparison with tractors, Various attachments & its applications Horn, Mobile Charger point, Head lamp and tail lamp Reflectors used in two wheelers Dash units Use of Speedometer (Analogy and digital), Trip meter Use of Engine Speed indicator/ Tachometer 5.9 Related Hydraulic Actuation in Above Special Purpose Vehicle
UNIT-VI Forklift Truck , tipper & road roller	1. Understand Forklift Truck-Types, Tipper – Types, construction & working tipping.	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. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

UNIT NO	TITLE OF UNIT	TEACHING HOURS	DISTRIBUTION OF MARKS			
			R	U	A	TOTAL MARKS
1	**UNIT-I** Earth Moving Machines – Introduction	06	04	02	04	10
2	**Unit-II** Tractor Dozer	08	04	06	08	18
3	**UNIT-III** Dragline (Rope Operated Excavator)	06	04	04	04	12
4	**UNIT-IV** Loaders & Excavators:	08	04	04	04	12
5	**UNIT-V** Tractor:	12	04	08	04	16
6	**UNIT-VI** Forklift Truck , tipper & road roller	08	04	04	04	12
	Total	48	24	28	28	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Visit to service center of Tractor or Dozer or Excavator or Fork lift or Road roller. Write report on various mechanisms used, service procedure adopted, cost of equipment and other financial aspects.	04
2	01	Visit to a mine/ construction site to observe various operations of Earth Moving Machines. Write a report on the visit..	04
3	03	Assignment on specifications and features like hydraulic circuit, control systems of any one earth moving machine,	04
4	04	Assignment on specifications and capacities of any one dozer. Draw the sketches of various dozer blades stating their	04

		applications.	
5		Assignment on applications of any one Rope operated excavator/ fork lift.	04
6	04	Assignment on working of crawler loader and its attachments/ road roller types and operations.	04

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a) Collect market rates for various Tractor components like clutch, gear box, brake shoes, wheels etc.
b) Form chart of clutch, gear box, types of treads pattern on tyre.
c) List out common trouble shooting in Brake system.
d) List out Tyre pressure require to different Tractors.
e) Report all the salient feature of a latest Special Purpose vehicle. Describe the technical and ergonomic features, if information is available. Comment on the aesthetic of the Any one vehicle. Separate models should be considered by a group of four students.
f) Prepare troubleshooting chart for failure of Hydraulic system(Symptoms, causes and remedies)

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1	Art of earth moving	---	---
2	Tractors and automobile.	K.K. Ramalingam	SCITECH-I

3	Tractors and their power units	R.B. Gupta	Satya Prakashan
4	Earth moving plant	K.K. Ramalingam	SCITECH-I

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :

a Hydraulic post.
b Pneumatic Line setup with tools
c Tractor wheelers
d Tools ,Equipment's , and Standard tools etc

12. LEARNING WEBSITE & SOFTWARE

1. http://www.wikipedia.com
2. http://www.howstuffworks.com
3. http://www.webelements.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Observe, compare and describe Special Purpose vehicle on basis of Aesthetics and Ergonomic considerations for their merits and demerits.		3								2		3
2	Understand the functions of various parts of a Special Purpose vehicle.		3			3		3					
3	Understand various systems of a Special Purpose vehicle.		2				2						
4	Use various facilities Available in an advanced Special Purpose vehicle		3		3								3

5	Check parameters like Hydraulics, PTO, Other related parameter etc in Special Purpose vehicle		3		3								3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- **AUTO ELECTRICALS & ELECTRONICS TECHNOLOGY**

COURSE CODE **6A407**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Forth

1. RATIONALE

Automotive electrical & electronics systems have been contributing in making motor vehicle efficient, effective, safe, comfortable, reliable, secure, and last but not the least environment friendly today. Extent of electronic, instrumentation, micro processing and information systems present advanced motor vehicles has been up to 40-50 %. Under such circumstances Automobile Engineering technician is required to get equipped with concepts, principals and procedural knowledge to enable him/her to diagnose Auto Electrical and electronics systems. Hence this compulsory a advance technology and award of class course is introduced.

2. COMPETENCY

At the end of studying this course students will be able to

"**Diagnose faults in Automobile electrical and electronics systems**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA**- Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Locate the Electrical and electronics systems of a given vehicle
2. Diagnose fault in Charging system of a given vehicle
3. Interpret Electric loom of a given vehicle
4. Diagnosis faults in any electric consumers in a motor vehicle
5. Diagnose fault in a electronic sensor and actuators of a given vehicles
6. Diagnose faults in control and communication systems of a motor vehicle

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Auto Electrical and electronics systems	1a. Identify parts of auto electrical systems 1b. Identify parts of electronics system 1c. Measure electronics and electrical quantities using correct instrument	1.1 Introduction to Auto electrical system- Need, sub systems- Generation, storage, distribution and consumer systems 1.2 Auto electrical equipment, instruments, gauges for diagnosis 1.3 Introduction to automotive electronics system- need, types subsystems – Measurement, control and communication systems 1.4 Auto electrical and electronics equipment, instruments, gauges for diagnosis 1.5 Standards and safety aspects related to AEEx systems
Unit - II Electrical generation, Storage and Charging system	2a. Identify alternator 2b. Select battery for a given vehicle 2c. Diagnose fault in charging system	2.1 Alternator as a generator, types, general construction & working, Electrical circuit and symbol 2.2 Battery as a Electrical storage- types, general construction & working, battery ratings and charging 2.3 Charging system- Types, General Circuit diagram with indicator

		lamp and working, importance parts – Regulator, rectifier, brush holder 2.4 Testing of alternator and battery – Types, equipment and tools, procedure, diagnosis of fault 2.5 Specifications of alternator and battery- reading, interpretation and selection
Unit - III Electrical Distribution system	3a. Interpret wiring diagram of a given vehicle 3b. Locate wire, connectors, fuse and earth terminal of a given circuit 3c. Diagnose fault in wiring loom of a given vehicle	3.1 Introduction – Layout, types, standards for distribution system – AIS, DIN, SAE, JIS, reading, interpretation and using for drawing and navigation 3.2 Wiring diagram- symbols, schematic diagram, section designation and device identification, terminal designation, connectors –types and code 3.3 Circuit protectors and switches – Purpose, Types, General construction & working, location, fuse & relay boxes 3.4 Wires & Connectors- Types, codes, 3.5 Diagnosis- equipment, tools and gauges and their use
Unit - IV Electrical consumer system	4a. Locate the consumer system in a given vehicle 4b. Locate corresponding supply, fuse, switch, earth, and terminals 4c. Diagnose fault in the consumer system of a given vehicle	4.1 Introduction – User of the electricity in motor vehicle, Lighting, starting, Ignition, fuel, Accessories and driver information systems 4.2 Lighting system- circuit, lamps & bulbs – types, construction & working, switches and relays 4.3 Starting system- Need, requirement, Circuit diagram, starter motor- types, general construction and working, faults and diagnosis

		4.4 Ignition system – Need, requirements, circuit diagram, parts, working, faults and diagnosis 4.5 Fuel systems- Requirement, types, circuit diagram, parts, working and fault diagnosis 4.6 Electrical accessories and instrument cluster, circuit diagram, parts, working and fault diagnosis- Horn, Wiper & washer system, electromagnetic clutch, Gauges- temp, pressure, level, speed, rpm etc, Sound and radio, power systems- window, sun roof, steering etc
Unit V Electronics measuring & actuating systems	5a. Identify a sensor 5b. Inspect a sensor for its working 5c. Identify an actuator	5.1 Sensors – requirement, types – position, velocity, acceleration & vibration, flow, temperature, concentration and other, construction, working and diagnosis 5.2 Actuators – requirement, types – Electro mechanical motors, solenoids, , fluid mechanical- direction and flow control valves, Thermal etc construction, working and diagnosis 5.3 Signals – requirement, types- analog, digital, their Processing- need, amplifier, filter, ATD, DTA 5.4 Engine sensors and actuators testing 5.5 Vehicle body sensors and actuator testing
Unit – VI Electronic Control and communi-cation system	6a. Identify ECU 6b. Justify use of the network in a given application 6c. Identify controller network in a given vehicle	6.1 Electronic control system- types- open loop and close loop, system architect – input, controller (compensator), Plant, output, signal, working, diagnosis 6.2 Automotive Microcontrollers- Operating conditions, design, Data

		Processing, Signal conditioning, Signal Processing, Output signal, control unit internal communication, EOL Programming, Digital modules in the controlling unit, Semiconductor memories, Control unit software, Background programme, Types of ECU and working 6.3 Introduction to Automotive Network – Purpose, requirements, types- based on data transfer rate, Networked vehicle topology 6.4 Bus systems CAN bus- Overview, Application, Topology, Data transmission system, Protocol, Hardware, Data transfer sequence, standardization, characteristics 6.5 LIN, - Overview, Application, Data transmission system, Bus access, Protocol- frame, header, synchronization, identifier, data field, description file, message scheduling, network management 6.6 MOST, Blue tooth, FlexRay,

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to Auto Elect. & Eltx system	06	02	02	00	04
2	Generation, Storage and charging system	08	05	05	05	15
3	Electrical distribution system	08	03	06	06	15

4	Electrical consumers	10	02	04	10	16
5	Electronics measurement system	08	03	04	08	15
6	Electronics control and communication systems	08	03	04	08	15
	Total	48	18	25	37	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Use of auto electrical & electronics related tools, gauges	2
2	2	Test working of starter in a given vehicle	4
3	2	Remove and refit battery of a given vehicle	2
4	3	Test continuity in wiring loom of a given vehicle	2
5	3	Study wiring loom of a given vehicle	2
6	4	Test working of ignition system	2
7	4	Test working of alternator in a given vehicle	2
8	5	Test various sensors for their working	2
9	6	Remove and refit ECU	4
10	6	Diagnose vehicle using Scan tool	4
11	6	Study Buses in a given vehicle	2
12	6	Identify bus topology of a given vehicle	2
13	5	Test actuators for their working	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Collection of auto electrical & electronics parts

b. Survey of vehicle wise ECU – make, no pins, arrangement pins, application, bus, etc

c. Study burning of ECU

d. Prepare Cut section of ECU

e. Prepare a loom for given circuit

f. Replace faulty relays

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Navigation in circuit diagrams
e. Activity based learning
f. Team teaching

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Auto electrical	Kolhi	London, Hutchinson
2.	Auto electrical	Nakra C P	London, Hutchinson
3	Auto electrical and electronics	Tom Denton	Elsevier
4	Auto Electrical system	Young & Griffith	Elsevier
5	Automotive mechanics	Crouse and Anglin	Elsevier
6	Understanding Automotive Electronics: An engineering perspective	William B Ribbens	Butterworth Heinemann

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Auto Electrical Test Bench	As per industry specification
2.	CAN bus demo model	As per industry specification
3	Multimeter	As per industry specification
4	Oscilloscope	As per industry specification
5	Scan (OBD) Tool	As per industry specification

6	Electrical Aggragates	As per industry specification
7	Function generator	As per industry specification
8	Magers	As per industry specification
9	Vehicle as a demo model	As per industry specification
10	Various Electrical and electronics aggregates	As per industry specification

12. LEARNING WEBSITE & SOFTWARE

1. http://www.boschautoparts.com
2. http://www.veejer.com
3. http://www.tomdenton.com
4. http://www.toyota.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Indentify electrical and electronics systems in a given vehicle	--	03	--		--	--	--	--	--	03	--	03
2	Diagnose a charging system of a given vehicle	--	03	03	03	--	--	--	--	--	--	02	03
3	Interpret a wiring diagram of a given vehicle	--	03		02	--	--	--	--	--	--	03	03
4	Diagnose fault of a consumer system in a given vehicle	--	03	03	03	--	--	--	--	--	--	03	03
5	Diagnose faults in sensors and actuators	--	03	03	03	--	--	--	--	--	--	02	03
6	Diagnose faults in the control and	--	03	03	03	--	--	--	--	--	--	01	03

	communication system of a given vehicle												

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- MECHANICS OF FLUID SYSTEMS

COURSE CODE 6A202

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. **RATIONALE:**

A motor vehicle though comprises of various systems with different names like energy supply system, transmission system, safety systems, comfort systems, security systems, convenience systems, pollution prevention systems etc all these subsystems contain fluid systems in a form or the other. Further the fluid systems are a part of many other engineering systems that contributes in manufacturing, servicing and repairs of motor vehicles

In any automobile industry the hydraulic and pneumatic controls systems are widely used for automation.
This course is introduced to impart knowledge of hydraulic and pneumatic circuits, their elements so that he will built up ability to carry out maintenance, erection of modern machine

2. COMPETENCY:

At the end of studying this course students will be able to

1.Analyse Fluid system present in Various systems of Motor Vehicle.

2.Apply knowledge of Fluid Mechanics for diagnosing faults in motor vehicle.

3. COURSE OUTCOMES:

Students will be able to –

1. Measure different fluid properties using appropriate instruments and gauges.
2. Describe the hydrostatics and buoyancy in Auto field.
3. Analyze Automobile fluids Mechanics.
4. Calculate various losses in Pipes and hoses.
5. Select appropriate systems for given applications.
6. Select appropriate Hydraulic pneumatic devices for given application as based on given specification.
7. Diagnose faults based on symptoms and remedies

4. TEACHING AND EXAMNATION SCHEME :

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and subtopics
1. INTRODUCTION	1a. properties Of fluid 1b.Basics concept of fluid	1.1 Fluid systems Concept and its need 1.2 Properties of fluids- Physical, thermodynamic, Classification of fluids, Viscosity, types of viscosity its units, Newton's law of viscosity, Surface tension, Cavitation 1.3Pressure and its measurement- Pascal's law, Absolute, gauge, atmospheric and vacuum pressures ,measurement instruments 1.4Concept of statics and dynamics as applicable to fluids
2.HYDROSTATICS AND BUOYANCY	2a.Total pressure 2b.Bouyancy concept	2.1 Introduction to hydrostatics 2.2 Total pressure & centre of pressure 2.3 Different Cases of surfaces to measure total pressure 2.4 Introduction to buoyancy and centre of buoyancy 2.5 Key concepts- meta centre, meta centre height 2.6 Conditions of equilibrium of a floating and submerged bodies 2.7 Application of hydrostatics and buoyancy- float valve,

3. MECHANICS OF FLUIDS	3a.kinematics and dynamics of fluid flow 3b.Bernuollis equation	3.1 Introduction to Kinematics of fluid flow 3.2 Types of fluid flow and their characteristics 3.3 Rate of flow and continuity equation 3.4 Introduction to kinetics/ dynamics of fluid flow 3.5 Equations of motion: Reynolds's equation, Euler's equation of motion, Bernoulli's equation ad its applications.
4.Flow through pipes	4a.major & minor loses 4b.power loses through pipes	4.1 Laws of fluid friction, Reynold no, friction loss in pipe flow, 4.2 Flow through pipes and its applications., major loses Darcy-Weisbatch equation, Chezy's formula simple numerical., 4.3 minor loses-entry, exist& accessories, 4.4HGL,TGL.,power transmission through pipes, max. efficiency of transmission water hammer in pipes-causes, effects and remedial measures
5 Introduction to Hydraulics & Pneumatic system	5a.Identify components of hydraulic and pneumatic system. 5b. List components of hydraulic and pneumatic system	**Hydraulic system** 5.1 Introduction to pumps & its types 5.2 Classification of pump-,screw pump ,gear pump, lobe pump, generator pump, screw pump, vane pump ,piston pump and its types Merits and limitations of oil hydraulic system, **Pneumatic system** 5.3 Atmosphere as reservoir ,compressor and its types filter ,pressure regulator, air valve ,air servo Merits and limitations of pneumatic system
6.Hydraulic & Pneumatic power devices	6a. Select pump, valves, accessories	6.1 Introduction of Control valve, 6.2 Classification of control valve, pressure control valve, pressure relief valve, pressure reducing valve, sequence valve 6.3 Directional control valve □ 2/2 valve □ Check valve □ 3/2 valve □ 5/2 valve □ 4/2 valve 6.4 Flow control valve 6.5 Variable flow control valve 6.6 Pressure compensated valve 6.7 Temperature compensated valve

		Accessories 6.8 Filter, 6.9 Types of separator, 6.10 Tubing & hoses
7.Basic hydraulic and pneumatic circuit	7a.Explain Hydro pneumatics 7b. Compare circuit 7c. Sketch circuit	7.1 Introduction to Hydraulic Circuit, Various symbols used in Hydraulic Circuits, Read & Draw Hydraulic circuit diagrams. Types of Hyd. Circuits a. Meter in b. Meter out c. Bleed off d. Sequencing circuit e. Regenerative circuit f. Speed control circuit by using bidirectional motor or two cylinders g. Sequencing circuit f. Time delay circuit, its application in vacuum handling 7.2 Industrial circuits for Milling machine ,Lathe machine, Grinding machine, Drilling machine Pneumatic circuit, Mechanical press.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction	05	02	04	02	08
2	Hydrostatics and Buoyancy	07	03	04	04	11
3	Mechanics of fluids	07	04	04	04	12
4	Flow through pipes	07	04	04	04	12
5	Introduction to Hydraulics & Pneumatic system	07	03	04	04	11
6	Hydraulic & Pneumatic power devices	07	04	04	04	12
7	Basic hydraulic and pneumatic circuit	08	03	07	04	14
	Total	48	18	25	37	80

7. **LIST OF PRACTICALS /LABORATORY / EXPERIMENTS /ASSESSMENTS** (ANY 10 SHOULD BE PERFORM)

Sr.No.	UNIT	TITLE PRACTICAL/ LAB. WORK/ ASSIGNMENTS/ TUTORIALS	HOURS
1	1	To find out mass density, weight density, and specific gravity of liduids and compare them	2
2	2	Measurement of meta centre height	2
3	3	Verification of Bernoulli's equation using ventury meter/ orifice meter	4
4	4	To determine minor loss of head in pipe joints.	2
5	4	To determine loss of head per unit length of different materials.	4
6	1	Calculation of pressure with the help of manometer	3
7	1	To study different types of manometers and gauges used in laboratories	2
8	2	Calculate weight of an object using fluid displacement method	4
9	3	Calculation of actual discharge	3
10	3	Perform Reynolds experiment for observing laminar and turbulent flows	2
11	6	To study different elements of hydraulic and pneumatic system	2
12	1	Measurement of pressure difference in ventury	2
13	7	Performance on hydraulic trainer	2
14	7	Performance on pneumatic trainer	2

8. STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

1. Survey of oil used for hydraulic systems -specifications, manufacturer's names, Cost etc
2. Survey of air filters and oil filters used in hydraulic and pneumatic systems.
3. Prepare cutout/model/chart of pumps and motors.
4. Prepare cutout/model/chart of pressure, direction and flow control valves.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Expert lecture
2. Industrial visit

3. One min essay
4 .Animated video
5. Group discussion and competition

10. SUGGESTED LEARNING RESOURCE

A. TEXT BOOKS:

S.No.	Name of Book	Author	Publication
1.	Industrial hydraulic and pneumatic system	Nitin sherje	Vision publication
2.	Fluid Mechanics	Indrajeet M. Jain	Tech max publications

B. REFERENCE BOOKS:

S.No.	Author	Name of Book	Publication
1.	Pippengen & Hicks	Industrial Hydraulics	Tata McGraw Hill Int.
2.	S. R. Mujumdar	Oil Hydraulic System – Principle and Maintenance	Tata McGraw Hill Co.
3.	S. R. Mujumdar	Pneumatics Systems – Principle and Maintenance	Tata McGraw Hill Co.
4.	Dr. P. N. Modi Dr. S.M. Seth	Hydraulic and Fluid Mechanics	Standard book house, Delhi
5.	V. Thanikachalam T.T.T.I. – Chennai	Hydraulics and Hydraulic Machinery	Tata McGraw Hill Co.
6.	Harry L. Stewart.	Pneumatics and Hydraulics	D. B. Taraporevala sons & co. private Ltd. Mumbai
7.	S. Ramamrutham	Hydraulics, Fluid Mechanics & Fluid Machinery	Dhanpat Rai publishing company
8.	Dr. Jagdish Lal	Fluid Mechanics and Hydraulics	Metropolitan books Co. private Ltd. Delhi
9.	Dr.R.K.Bansal	Fluid Power	R.K.Publishers,Delhi
10.	Sameer Shaikh & Iliyas Khan	Treaties on Hydraulics	R. K. Publication, Kolhapur

		Pneumatics Fluid system	

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. Bernoulli's equipment
2. Manometer
3. Hydraulic and pneumatic trainer

12. LEARNING WEBSITE & SOFTWARE

1. http://www.wikipedia.com
2. http://www.howstuffworks.com
3. http://www.webelements.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Measure different fluid properties using appropriate instruments and gauges.	3		2								03	--
2	Describe the hydrostatics and buoyancy in Auto field.		3									--	03
3	Analyze Automobile fluids Mechanics.	3										03	03
4	Calculate various losses in Pipes and hoses.										3	--	03

5	Select appropriate systems for given applications.	3		2								--	--
6	Select appropriate Hydraulic pneumatic devices for given application as based on given specification.		3								3	03	03
7	Diagnose faults based on symptoms and remedies	3		2									

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary - Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE **AUTO BODY TECHNOLOGY**

COURSE CODE **6A402**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

This is one of the applied Technology (AT) level courses. The time taken to build a new body and performing its repair in the event of an accident is more than that for producing and repairing vehicle with a mechanical damage. Accident repair activity in any service station contributes substantially in annual turnover of any service station. Based on above facts it is vital for Automobile Engineering technician to get equipped with factual, conceptual, scientistic and procedural knowledge about vehicle body. This compulsory and award of class course is introduced to achieve it.

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyze the body of a given vehicle during production and an accidental repair .**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
2	-	3	5	80	20	25@	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify a body structure of a given motor vehicle
2. Inspect various parts of the body of a given vehicle for repair and replacement
3. Inspect alignment of a given vehicle body/ frame
4. Supervise fabrication & repairs of body
5. Identify materials used in the body of a given vehicle
6. Inspect quality of painting for paint defect

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to automobile body	1a. Identify various parts of the body of a given vehicle 1b. Inspect the body of a given vehicles for its technical and functional aspects 1c. Apply AIS for a given vehicle body	1.1 Definition and Requirement of auto body- Safety- passive, crashworthiness, external safety, internal safety, drag and lift considerations, introduction to international safety standard 1.2 Body as a mean to accommodate functional systems viz. comfort, convenience, safety, security system of motor vehicles 1.3 Body as an anchorage to various systems, mechanisms & parts 1.4 Terminology of a body: Overall Length, width, and height, Wheel base, Wheel track, ground clearance, FOH, ROH, Angle of approach, angle of recess, head room, leg room, knee room, shoulder room, height of CG, weight bias and specifications of different bodies 1.5 Legitimate requirements of auto body in India, AIS 052, other body related standards
Unit - II Science of Auto body construction	2a. Apply knowledge of sciences related to auto body in construction and repair of auto bodies 2b. Calculate drag and lift of a	2.1 Aerodynamics- Pressure drag, skin drag, interference drag, ventilation drag, shape of vehicle body to reduce different drags, aerodynamic shape, testing of vehicle body- wind tunnel test

	body of a given vehicle 2c. Analysise driver seat based on ergonomical aspects	2.2 Aesthetics- Science of beauty, elegance and its application in auto body 2.3 Ergonomics- Science of making products human organ friendly & human anatomy and its use in designing seats and seat layout 2.4 Performance of vehicle: Cruising, accelerating, negotiating inclined & curved path 2.5 Dynamics of vehicle and its relation with a vehicle body
Unit - III Body Construction of commercial vehicle (CV) body	3a. Identify body construction of a given CV 3b. Select a body construction for a given CV application 3c. Diagnose fault in a given CV body	3.1 Types of construction and their characteristics: Frame body, semi-integral, integral (monocoque), Three box 3.2 Body based on control: Normal (COE), Semi –forward, forward control(CBE), Tilt cab and comparison among them. 3.3 Frames: Types- Ladder, Cruciform, terminology- Long member, cross member, Upswept, down-swept, Uniform, and non-uniform, Defects- Sagging, hogging, loosening, twisting etc 3.4 Body: types- all metal, timber, aluminum, composite, construction: floor, sides, roof, cross bearers, wheel box, various rails viz. skirt, seat, waist, breast, cant etc, roof sticks, pillars, wheel arch, bays, panels, trims 3.5 Mounting of a body: Brackets, U bolts, Balata packing 3.6 Comparison among freight and passenger vehicles, legal terminology of CV
Unit - IV Construction of Four wheeler (4W) body	4a. Identify the body construction of a given four vehicle(Car) 4b. Select a body construction for a given type of car 4c. Analysise a car for safety consideration	4.1 Passenger cars: Types & purpose Hatchback, lift-back, Sedan (full & compact), Coupe (Sport & Normal), Limousine, convertible, Safari etc and related body construction, differences 4.2 Utility Vehicles- Types- MUV, SUV, LUV, XUV etc & Purpose,

		related body construction and differences 4.3 Construction-Monocoque, semi-integral, frame-body, based on number of doors- two (coupe), three, four doors, based on roof – open, close, convertible, and estate, based on boxes – three box, sedan, hatchback, based on privacy to an owner- normal and limousine 4.4 Terminology in passenger cars (parts): Back light, body sill, boot, saloon, bonnet(hood), bottom side, baulk head, cant rail, central pillar, door skin, door trim, drip molding, fender, fire wall, head lining, heel board, hinge pillar, pillar face, quarter light, quarter panel, scuttle panel, squab, turret(roof) 4.5 Terminology in 4 wheelers: Head room, leg room, knee room, shoulder room, heel point, hip point, eye level, vision and their significance 4.6 Major parts: Under body, body side assemblies, shroud and dash panel assembly, roof and back window aperture panel, centre pillar, rear baulk head& parcel shelf, front end work, front wings, front door panel assembly, bonnet panel assembly and boot lid assembly 4.7 Car body fabrication- tools and techniques
Unit – V Construction of two wheeler (2W) body	5a. Identify the body construction of a given 2 wheeler 5b. Select a body construction for a given type of 2 wheeler 5c. Analysise a 2 wheeler for safety consideration	5.1 Requirements & types of body construction: Superbikes, Motor cycles, scooters, scooterrettes , and mopeds 5.2 Two wheeler body construction: frame-body type, types of frames-backbone, Under bone, diamond, crèche (cradle), perimeter, and delta, uni-body etc their construction, fabrication and significance. 5.3 Nomenclature of Motor cycle frames parts & their roles: head

		tube, top tube, down tube, engine bracket, swing arms, triple rod, saddle, carriage, sari guard, foot rest, fuel tank 5.4 Scooter body construction: semi integral, 5.5 Moped body construction 5.6 Two wheeler body fabrication – process, requirement, shop and equipment
Unit – VI Auto body material and processes	6a. Identify the material in a given vehicle body 6b. Identify defect in a given vehicle body	6.1 Requirement of auto body material: strength, corrosive resistance, malleability, ductility, machinability 6.2 MS , alloy steel , aluminum, magnesium, GRFP, balata packing, rubber glazing, glass, fasteners, 6.3 Sheets, angles , cleats, gussets, engineering properties, gauge and composition 6.4 Shops involved in body fabrication & finishing and their role: Press shop, chassis shop and paint shop their specialty and roles 6.5 Denting and painting of accidental vehicles- equipment, tools, procedure 6.6 Modern paints and techniques of their application

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction	04	02	04	04	10
2	Science of auto body	04	04	06	04	14
3	Construction of CV Body	06	04	04	06	14
4	Construction of Car body	06	04	04	06	14
5	Construction of two wheeler body	06	04	04	06	14
6	Auto Body materials and	06	04	06	04	14

	processes					
	Total	32	22	28	30	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Critical study of body specifications of two dissimilar cars	04
2	01	Critical study of body specifications of two dissimilar passenger vehicles	04
3	03	Critical study of body specifications of two dissimilar goods transport vehicles	04
4	04	Observe and measure various dimensions of car	04
5	03	Observe and measure various dimensions of bus	04
6	04	Observe and measure various dimensions of Multi utility vehicle	04
7	03	Study of various frames	2
8	04	Study of Car Body	2
9	03	Study of bus body	2
10	03	Study of freight transport vehicle	2
11	05	Study of motor cycle body	2
12	05	Study of various motor cycle frames	2
13	05	Study of scooter body	2
14	05	Study of scooter frame	2
15	04	Study of Bonnet, saloon and boot compartments of two different cars	**2**
16	06	Study materials used in car body	**2**
17	06	Study materials used in truck and bus body	**2**
18	06	Study various materials used in 2 wheelers	**2**
19	06	Perform spray painting	**2**
		Total hours	**48**

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey for various Auto body builders

b. Field survey of bus and truck body builders

c. Explore various bus body related events

d. Competition on body styling

e. Survey for body material for specification

f. Survey of any one car body designer

g. Study historical evolution of body construction

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning
f. Work based experience

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Fundamentals of Vehicle Body Work	Fairbrother, J.	London, Hutchinson
2.	Vehicle Body Reconditioning	Fairbrother, J.	London, Hutchinson
3	Motor Body Repair and Refinishing	Weston, E.B.	London, Newnes-Butterworths
4	Fundamentals of Automobile Body Structure Design	Malen, D.E. (2011)	. Warren dale USA, SAE
5	Passenger Car Body	Anselm, A.	Warren dale USA, SAE
6	AIS 052 Code of Practice for Bus body design and approval	AIS committee	ARAI Pune
7	The world history of Automobile	Eric Eckermann	SAE publication

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Compressor and pneumatic structure	As per Auto industry specification
2.	Paint gun	As per Auto industry specification
4	Body and fender tool kit	As per Auto industry specification
5	Body pullers	As per Auto industry specification
5	Welding machines – gas, arc, resistance	As per Auto industry specification
6	Bodies and frames of all types of vehicles	As per Auto industry specification
7	Paint & related material	As per Auto industry specification
8	Sheets, sections, glasses, clits, gussets, rubber glassing, adhesives paste	As per Auto industry specification

12. LEARNING WEBSITE & SOFTWARE

1. http://www.araiindia.com
2. http://www.cirtindia.com
3. http://www.starlineautobodies.com
4. http://www.cebbco.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify body structure of a given vehicle	--	03	--	--	--	--	--	--	--	02	02	03
2	Inspect parts of the body of a given vehicle	--	--	03	03	03	--	--	--	--	--	--	03
3	Inspect alignment of a given vehicle body	--	--	03	03	--	--	--	--	--	--	03	03

4	Supervise fabrication and repairs of a body	--	03	--	03	--	--	--	--	--	--	03	03
5	Select a material for a given body fabrication	--	03	--	--	03	--	--	--	--	--	03	--
6	Identify paint of a given vehicle	--	03	--	--	--	--	--	--	--	--	03	03

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE ENGINE TECHNOOLOGY

COURSE CODE 6A403

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

A motor vehicle represents a class of engineering system, as it evolved primarily for the sake of providing comfort and convenience to a mankind. Every motor vehicle system comprises many systems along with an engine as a prime mover. The Engine being the prime mover of automobile vehicle, an automobile engineering technician should know various types of engines, their working and different systems employed in sound working of automobile engine. This course introduced at advance technology level intends to develop the skills of identification and location of engine parts, and its functions, procedure for disassembly & assembly of systems and components related to automobile engine.

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyze the advances in automobile engines**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA**- Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Differentiate between working principles and construction of SI and CI engine.
2. Analyze combustion chamber of SI & CI engine.
3. Locate various parts of given carburetor and conventional and modern ignition system.
4. Identify and explain working of given fuel injection system of CI engine.
5. Locate various system and subsystem of IC engine.
6. Plot and analyze engine performance characteristic.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Automobile Engines	1a. Classify IC engine. 1b. Write engine nomenclature. 1c. Describe function construction & material for engine components.	1.1 Classification of I.C. Engines, Basic engine terminology. 1.2 Cycle of operations in four strokes and two-stroke SI and CI engines, valve timing diagrams & their comparative study; Scavenging, type of scavenging & blowers. 1.3 Engine subsystem and components (Cylinder block, cylinder liner, Cylinder head, gaskets, Piston, Piston rings, Piston pin, Crank shaft, camshaft, Types of camshaft drives, Connecting rod, valve, valve mechanisms, valve timing, manifolds, silencers etc.) 1.4 Fuel air cycles, Variable specific heat and its effects, Dissociation and other losses, Actual cycles, Deviation of actual engine cycle from ideal cycle.
Unit - II Theory of Combustion	2a. Compare normal combustion of SI & CI engine. 2b. Compare abnormal combustion of SI & CI	2.1 Introduction 2.2 Combustion in SI engine, Ignition limit, Stages of combustion in SI engine. 2.3 Effect of engine variables on

	engine.	Ignition lag. 2.4 Effects of engine variables on flame propagation. 2.5 Abnormal combustion-Detonation, Pre-ignition & effects of detonation. 2.6 Effect of engine variable on detonation, Control of detonation. 2.7 SI engine combustion Chambers. 2.8 Stages of combustion in CI engine. 2.9 Delay period and variables affecting delay period. 2.10 Diesel knock and its control. CI engine combustion chambers.
Unit - III SI Engines	3a. Describe basic principal of carburisation. 3b. Identify various circuits of given modern carburetor. 3c. Trace the wiring of conventional and modern ignition system. 3d. Compare different types of spark advance mechanism.	**PART A (Carburetion):-** 3.1 Properties of the air-fuel mixtures, mixture requirement for steady state operation, distribution. 3.2 Theory of carburetion, Simple carburetor, Essential parts of modern carburetor, limitation of simple carburetor, Types of carburetors (Carter, Solex & SU) **PART B (Ignition Systems)**:- 3.3 Need of ignition system, Spark Plug and its requirements, Ignition timing. 3.4 Working of battery and magneto ignition systems, electronic ignition systems with and without contact breakers. 3.5 Spark advance mechanisms.
Unit - IV CI Engines	4a. Describe requirement of fuel injection system. 4b. Compare different injection system in diesel engines. 4c. Compare different fuel injection pump.	4.1 Introduction 4.2 Heat release pattern and fuel injection. 4.3 Requirement of a diesel injection system. 4.4 Types of injection system i.e. solid injection systems. 4.5 Conventional plunger type fuel pump, Rotary fuel pump, fuel injectors and type of nozzles.

		4.6 Spray formation, spray direction and injection timing.
Unit - V IC Engine System	5a. Describe purpose of lubrication system 5b. Compare different types of lubrication system. 5c. Describe properties of given lubricant on the basis of grade. 5d. Explain types of cooling system in IC engine. 5e. Locate the various parts and integrated subsystem of cooling system. 5f. Describe purpose of supercharging and interpret its effect on engine performance.	**Engine lubrication :-** 5.1 Total engine friction, need of lubrication system and lubrication principles. 5.2 Type of lubricating systems. (Mist, splash, modified splash and pressurized lubrication.) 5.3 Properties of lubricating oils, additives and their advantage. **Engine Cooling:-** 5.4 Necessity of engine cooling and effect of overcooling and under cooling on engine systems. 5.5 Type of cooling system as air cooled and liquid cooled and their comparisons. 5.6 Type of radiators and mechanism of cooling fan. **Supercharging:-** 5.7 Objectives, Effects on power output and engine efficiency. 5.8 Methods, Types and Limits
Unit – VI Testing and performance of IC engine	6a. Calculate the performance parameters of IC engine. 6b. Implement engine testing methods & prepare heat balance sheet.	6.1 Introduction 6.2 Performance parameter 6.3 Measurement of brake power. 6.4 Measurement of friction power. 6.5 Measurement of indicated power. 6.1 Heat balance sheet. (simple numerical on engine performance parameter & heat balance sheet)

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to Automobile Engines	10	04	08	04	16
2	Theory of Combustion	06	02	04	04	10
3	SI Engines	08	04	06	04	14

4	CI Engines	08	04	06	04	14
5	IC Engine System	10	06	06	04	16
6	Testing and performance of IC engine	06	02	04	04	10
	Total	48	22	34	24	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Demonstrate two- stroke cycle engine and identify various components of engine.(using cut section)	2
2	01	Demonstrate four- stroke engine and identify various components of engine. (using cut section)	2
3	01	To dismantle and assemble four stroke and two stroke engine of two wheelers.	2
4	03	Demonstrate ignition system of two wheelers and four wheelers and identify various components of it.	2
5	03	To remove the carburetor from the engine of motor cycle, identify and check the components, draw the circuits and refit.	2
6	04	To dismantle the BOSCH reciprocating plunger type fuel injection pump and identify the components draw sketch and reassemble	2
7	04	To dismantle the BOSCH rotary plunger type fuel injections pumps and identify the components draw sketch and reassemble.	2
8	04	To dismantle different type of fuel injectors identify the components draw sketch and reassemble.	2
9	04	To dismantle different type of fuel feed pump and fuel filter and identify the components draw sketch and reassemble.	2
10	05	Calculate viscosity of various sample of automobile oil with the help saybolt viscometer.	2
11	05	Demonstrate cooling system of two wheelers and four wheelers and identify various components of it.	2
12	05	To 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.	2
13	05	To dismantling and assembly of oil pump, oil filter and pressure relief valve and identify various components, clean, inspect and refit.	2
14	6	Perform a load test and speed test on multi cylinder petrol engine and plot the graph to show the performance characteristics of engine.	2
15	06	Perform a morse test on multi cylinder petrol engine and calculate frictional power and mechanical efficiency of engine.	2
16	06	Prepare a Heat Balance Sheet for single cylinder, four stroke	2

		diesel engine.	
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Market survey on technical specification and cost of any two engine components.
b. Seminar and report writing on any topic mention in above units by group of two students).
c. Prepare a report on industrial visit to Service or Manufacturing industry of Auto sector.
d. Mini project in the group of min. 2 and max. 5 students.
e. Poster presentation on any topic mention in above units or latest development in the field of internal combustion engine.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	A course in internal combustion engine	M.L Mathur, R.P.Sharma	Dhanpat Rai Publication
2.	A course in internal combustion engine	V. Ganeshan	Tata McGraw Hill
3	Automobile Engineering	R. B. Gupta	S. Chand
4	The Motor vehicle	Newton, Steeds, Garrett.	Butterworth Heinmann.
5	Automobile Engineering Vol.-2	Dr. Kirpal Singh	Standard Publishers.

6	Automobile Engineering Vol. I - Engines.	Anil Chikara	Satya Prakashan, New Delhi

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :

S. No.	Name of equipment	Brief specification
1	Morse test rig	**Engine:** Engine 3/4 cylinder, 4 strokes, water-cooled. Alternator, solenoid, ignition switch, and brand new maintenance free Battery. Knife switch provision for conducting Morse Test. The engine is complete with clutch plate assembly, clutch Rod, Accelerator control, and self-starter. **Speed Measurement:** Digital rpm indicator. **Loading Device:** Cast iron Brake drum /Hydraulic dynamometer / Eddy current coupled to the engine through flexible coupling. **Panel:** Laminated panel on a sturdy MS stand with all measuring instrument mounted neatly. Knife switches in an enclosure for Morse test. Fuel intake measurement. **Air Intake Measurement:** It consists of an air tank of size 0.5 x 0.5 x 0.5 M fitted with baffle orifice plate. A U tube manometer to measure differential pressure
2	Heat Balance sheet test rig	**Engine :** Four Stroke Four Cylinder Diesel Engine **Accessories :** An ignition switch, a radiator, a self-Starter, a battery ammeter, a throttle control with an indicator for throttle opening, clutch arrangement **Fuel arrangement:** Fuel tank mounted on a sturdy Iron stand burette tube, 3-way clock connecting tube. **Cooling water arrangement:** Cooling water Arrangement by cooling piping. A measuring jar to determine the discharge of cooling water.

		Air intake measurement: Air intake reservoir with Orifice plate and differential manometer. **Multi-channel Digital Temperature Indicator :** To Measure the temperature at various points **Exhaust Gas Calorimeter:** The whole unit is mounted on a sturdy frame.
3	Saybolt viscometer	**Saybolt Two- Tube Digital Viscometer** The viscometer can be used for temperatures between21 to 99°C (70 to 210°F) the viscometer includes water oil bath, stirrer, cooling coil, electric heater with digital thermo regulator, furol orifice, universal orifice, thermometer support and 2 x 60 ml glass Saybolt Viscosity Flask. Viscosity thermometer set consists of 6 thermometers with the temperature ranges; 19 to 27°C, 34 to 42°C, 49 to57°C, 57 to 65°C, 79 to 87°C (250 mm length) and 95 to 103°C where each thermometer with 0.1°C sub divisions. Power : 750 W

12. LEARNING WEBSITE & SOFTWARE

a. http://www.wikipedia.com/heat_engine
b. http://www.howstuffworks.com
c. http://www.webelements.com
d. http://onlinecourses.nptel.ac.in

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Differentiate between working principles and construction of SI and	-	3	-	2	2	-	-	-	-	-	-	3

	CI engine.												
2	Analyze combustion chamber of SI & CI engine.	-	3	-		-	-	-	-	-	-	-	2
3	Locate various parts of given carburetor and conventional and modern ignition system.	-	3	-	2	-	-	-	-	-	-	-	3
4	Identify and explain working of given fuel injection system of CI engine.	-	3	-	2	-	-	-	-	-	-	-	3
5	Locate various system and subsystem of IC engine.	-	3	-	2	2	-	-	-	-	-	-	3
6	Plot and analyze engine performance characteristic	-	3	-	3	3	-	-	-	-	-	-	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTO TRANSMISSION TECHNOLOGY

COURSE CODE 6A405

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fourth

1. RATIONALE

A motor vehicle represents a class of engineering system, as it evolved for the sake of providing primarily comfort and convenience to a mankind. Automobile engineering technicians (AET), 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 with it.

This is the Advance Technology course that deals with construction and working of various transmission systems in general and their sub systems in particular that equip AET to deal with them satisfactorily

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyze given transmission system**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
2	-	3	5	80	20	25#	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify transmission system for a given vehicle layout.
2. Differentiate various types of clutches used in Motor Vehicle.
3. Differentiate various types of Gearboxes used in Motor Vehicle.
4. Compare various types of Drive Trains used in Motor Vehicle.
5. Differentiate various types of Final Drive used in Motor Vehicle.
6. Select types of Wheel/Rims/Tires used in Motor Vehicle as per the application.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Introduction To A Transmission System	**1**. To know the main purpose of transmission system. 2. To know the path of power transmission. 3. Various types of turning radius with or without transaxle. 4. To know the changes in motion of vehicle with clockwise or anticlockwise rotation of engine crankshaft.	1.1 Transmission system as a part of a direct system of motor vehicle 1.2 The system to transmit power supplied by an engine to driving wheels 1.3 Performances of a vehicle viz. advancing & reversing, cruising & accelerating, ascending & descending grade, negotiating curved path in either directions as an input to transmission system 1.4 Limitations of engine to cater to the power requirements in various vehicle performances as a need 1.5 Various vehicle layouts and corresponding transmission systems
2.Automobile Clutches	1. To know the purpose of clutch and its operating mechanism.	2.1 Types of clutches- dog clutch & friction clutch- cone & plate 2.2 Need of gradual engaging clutch

	2. Classify the clutches and its subtypes. 3. Design considerations to the clutches. 4. Method of operating the clutches. And select the best method. 5. To know the list of failures occurring In the clutch plate. 6. To understand the concept of coefficient of friction between clutch plate and friction surface. 7. Taking place of hydraulic component used in clutches.	in motor vehicle- concept of slip, its use in clarifying gradual engagement 2.3 Automotive clutch – principle, general construction – drive member, driven member, energy supply system, actuating system, Cover and working. 2.4 Classification of automotive clutch- Manually operated, semi automatic and automatic, based on number of plates- Single and multi plates, based on Spring- coiled & diaphragm clutch, Based on linkage -Mechanical & Hydraulic, Types of automatic mechanism- Centrifugal & fluid flow, medium of operation- dry and wet type (Construction, working of each along with comparison between them) 2.5 Details of clutch plate, pressure plates, Diaphragm spring 2.6 Hydraulic clutch – construction – Slave and master cylinder, working 2.7 Fluid coupling as an automatic clutch- principle, construction and working
3. Gear Boxes	1. Able to know the functions of gear box, gear ratio and its use.	3.1 Introduction - Box/ case which contains shafts, gears, bearings, oil etc and selector mechanism 3.2 Key concepts- Gear terminology, gear

	2. Able to find out the center distance between two shafts and can know the details about terminology of gear. 3. To know the different types of gear train and fluid flywheel. 4. To know the gear operating system and its performance. 5. To identify the best suitable gearbox to suit a certain vehicle. 6. Introduction to gear less auto transmission system.	train-simple, compound and epicyclic , gear ratios in them , centre distance between shafts, 3.3 Types of GB- Manual & Automatic, Based on number of ratios, Normal and epicyclic GB, Based on gear meshing- Sliding mesh, constant mesh, synchromesh 3.4 General construction of gear box- Gear box casing, Clutch shaft, lay shaft, main shaft, reverse shaft, speed gears I, II, III, IV, Gear box top, Selector mechanism- selector rod, fork, gear lever, gear knob, balls and spings 3.5 Evolution of gear box – key concepts double declutching, synchronizing, fool proof design 3.6 Need, Construction and working of Overdrive, Auxiliary gear box 3.7 Automatic gear box- Construction and working, selecting mechanism, comparison with manual GB, Variomatic drive 3.8 Torque Converter- principle, construction and working
4. Drive Train	1. Propeller type and shaft construction. 2 To study the advantages and disadvantage of Hotchkiss and torque tube drive. 3. To identify the types of	4.1 Necessity and function of drive train 4.2 Types of drive trains-Belt & pulleys, Chain and chain wheels, Hotchkiss drive, torque tube drive (only for academic purpose)

	power transmitting devices and it's working.	4.3 Effect of Vehicle layouts on nature of drive trains 4.4 Need, Construction and working of Hotchkiss drive- End torque reaction, Hooke's joint, slip joint, limitations of Hooke's joint 4.5 Constant velocity joint- principal, General construction, working, types –based on Design: Zeppa, tracta, Carden, Location- Inboard & Outboard, Based end movement- Plunging & non plunging type 4.6 Other types of drive trains
5.Differential And Drive Axle	1. Knowledge about how to turn a vehicle at different road wheel radius. 2. Applications and animation of ring gear side gear and sun gear.	5.1 Necessity of final drive and differential –four wheelers, inner and outer wheels, radius of curvature, centre of curvature 5.2 Differential action and construction and working of differential 5.3 Types of differentials- based on Crown wheels- Bevel- straight & spiral, hypoidal, worm and worm wheel type 5.4 Limitations of differential and limited slip differential, its construction and working 5.5 Selective assembly of crown wheel and pinion and their contacts, pre loading
6.Wheels And Tyres	1. To know the tire should be well known.	6.1 Introduction- Wheels as a last member of direct system,

	4. able to change the tire and make a puncture free tire. Different types of tyres, wheel, rims and choose the suitable one. 2. To know the geometrical concepts and construction of tyres tread.	responsible converting power in to motion 6.2 General construction-Wheel disc: Hub, web, rim and tube tyre, 6.3 Wheel disc- Geometry –Clamping surface and Zero swept, in swept and out swept, rim types- deep well, split, single piece, two piece, three piece, 6.4 Construction of tyre- Bead, side walls, shoulder, tread, plies, belt, types-cross ply, belted cross ply and radial, tubed and tubeless 6.5 Specifications of tyres- as per standards 6.6 Tyre inflation and its effect

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction To A Transmission System	**04**	**2**	**6**	**4**	**12**
2	Automobile Clutch	**08**	**4**	**8**	**2**	**14**
3	Gear Boxes	**10**	**4**	**8**	**4**	**16**
4	Drive Train	**08**	**4**	**4**	**4**	**12**
5	Differential And Drive Axle	**10**	**4**	**6**	**4**	**14**
6	Wheels And Tyres	**08**	**2**	**2**	**8**	**12**
Total		**48**	**20**	**34**	**26**	**80**

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	**1**	Introduction to automobile transmission system and its application	**02**
2	2	Draw various vehicle layouts for- two wheelers, three wheeler and four wheelers and compare them.	**02**
3	**3**	Open a single plate dry clutch assembly and sketch exploded view. Flywheel introduction	**04**
4	**4**	Open a multi-plate clutch, Diaphragm clutch and centrifugal clutch used in two wheelers. Four wheeler and observe the operating linkages and sketch the system.	**04**
5	5	Open any two types of gear boxes observe gear shifting, gear ratio and sketch the system & compare them.	**04**
6	6	Open & observe automatic transmission devices such as torque converter, fluid flywheel.	**02**
7	7	Open & observe universal joints such as Hooks universal joint.	**02**
8	**8**	Open and observe the propeller shaft, Hotchkiss and torque tube drive.	**04**
9	9	Open the differential, sketch the unit with bearing locations. Rear transaxle	**04**
10	10	Open any two types of tires, wheels and rims, observe and sketch.	**04**
		Total Practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Student should create the flow process chart of sequence of transmission layout.

b. They should assemble and dismantle the various parts of automobile.

c. They should visit the nearest production unit of transmission system and gain the require knowledge.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-

b. Q & A technique.

c. Demonstration

d. Dissection

e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	A text book of automobile engineering.	R. K. Rajput	Laxmi Publication
2.	A text book of automobile engineering	S. K. Gupta	S. Chand Publication
3	Automotive Mechanics	S. Srinivisan	TATA McGraw – HILL
4	Automobile Engineering	R.B. Gupta	Satya Prakashan New Delhi

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Bicycles – conventional, geared with front and rear suspension and disc brakes	As per Bicycle industry specification
2.	Aggregates of bicycles	As per Bicycle industry specification
4	Bicycle tools	As per Bicycle industry specification

5	Frames	As per Bicycle industry specification
6	Spares	As per Bicycle industry specification
7	Wheel Trueing machine	As per Bicycle industry specification

12. LEARNING WEBSITE & SOFTWARE

a. bhttp://www.wikipedia.com

b. http://www.howstuffworks.com

c. http://www.webelements.com

d. http://www.educationworld.com

e. http://www.carengineer.com

f. http://www.mechanicalmeniablogspot.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify transmission system for a given vehicle layout.	03	03	--	--	03	--	--	--	--	--	03	--
2	Differentiate various types of clutches used in Motor Vehicle.	--	03	--	--	03	--	--	--	--	--	--	03
3	Differentiate various types of Gearboxes used in Motor Vehicle.	--	03	--	--	--	--	--	--	03		03	03
4	Compare various types of Drive Trains used in Motor Vehicle.	--	03	--	03	--	--	--	--	--	--	--	03

5	Differentiate various types of Final Drive used in Motor Vehicle.	--	03	--	--	05	03	--	--	03	--	--	--
6	Select types of Wheel/Rims/Tires used in Motor Vehicle as per the application.	--	03	--	03	--	--	--	--	--	--	03	03

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- INDUSTRIAL TRAINING

COURSE CODE 6A503

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

Automobile engineering technician program is mainly integrated with practical experiences. A technician is responsible for the quality supervision, production and proper maintenance of different automobiles and automobiles components. While working in the industry a technician is employed for planning, preparation, supervision, and quality control. Arrangement of raw materials, labors and equipments are also the role of a technician. In plant training program will help in enhancing the knowledge and skills of the technicians.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of estimating skills so that students are able to acquire following competency.

"Establish or relate theoretical knowledge with practical site situations to enhance career and professional skills"

1. Identify the Industry in manufacturing field and work in group.
2. Identify the resources: manpower, material machines and money for completion of project.
3. Identify safety measures required for project and verify the availability/compliance of the safety measures, at the site.
4. Maintain daily dairy to note the observations at the site /sections on daily basis.
5. Prepare a detailed report based on the learning experiences during Industrial Training.

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)					
				Theory		Practical			Total
L	T	P	C	ESE	PT	ESE (PR)	ESE (OR)	PA (TW)	350
-	-	14	14	--	--	50#	100#	200@	
Duration of the Examination (Hrs)				--	--	--		--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify the manufacturing processes in industry and develop spirit of enquiry in group.
2. Collect the data and write daily reports of the work on site along with sketches / drawings.
3. Observe problem solving techniques at site by the Engineer In-Charge in Industry.
4. Observe manpower requirement according to work allotted and skill required.
5. Observe the facilities such as arrangement of water, Electricity and Machineries at site.
6. Learn the different processes, their costing and designs by referring details / drawings.
7. Prepare and present the report of Industrial Training work.

5. DETAILED COURSE CONTENTS

Following are the general guidelines for implementation of Industrial Training

1 Student studying in Final year automobile engineering program is expected to work in a group of 4-5 students for Industrial Training. Each group shall work parallel with a regular employed person of the permitted industry as a trainee in a small industry /manufacturing site / firms / consultation services or any specialized services for entire one term(semester of 16 week) as decided by the Chairman and PBOS members under the guidance of CDIC, Exam Cell and departmental faculty members.

2 Finally the students in group shall prepare the report of his/her Industrial Training under the guidance of the teaching staff members and Industry In-Charge guide which should consists of processes, procedures, observations, drawings, sketches, sample calculations / simple designs, applications, managements, Services, after cell service policy, costing aspects. Student shall deliver a seminar on his/her experiences during Industrial training.

3 Preferable Period:

a. Industrial Training is to be undertaken after the completion of registration process of 5^{th} semester. All admitted students will be undergoing for one week orientation programme on Industrial Training. During orientation students are required to form a group of 4 to 5 students in each group. Group size and group students will be decided by faculty members and Head of the department. The industries shall be allocated to each group by the department in consultation with Training and placement Department.

b. During the industrial training, one day per week students have to report to institute guide for continuous assessment and guidance. During institute visit student have to show weekly report (day wise) and progress of assign work by institute and industry guide.

c. After successful completion of industrial training student shall report back to institute for completion of term work, progressive test, credits of other three subjects and end semester exam.

4. Marking Scheme**:**

A. Term Work (PA/TW) (200@)**:-** Out of 200 marks of Term Work;

- 50 marks are assigned to daily diary which is being continuously assessed by industry guide and on weekly basis from institute guide.
- 100 marks are assigned for two presentations during entire training duration. First after 30 days from start of training and second after 90 days from start of training. (i.e. each presentation is of 50 marks).

  Note: 1. First month completion presentation should includes industry history, product / service details, organizational structure and layouts of each shop floor, safe working practices followed by the industry etc.

  2. Third month completion presentation should include above points as well as details of technical task experience and some critical / special experiences student has undergone (mentioned in his daily diary) at industry.

- Remaining 50 marks is assigned to Report writing of Industrial Training.

B. ESE (PR/OR) (150#)**:-** Out of 150 marks 50 marks are allotted by industrial guide on the basis of overall performance, knowledge, punctuality, leadership, task completion and behavior of student during industrial training in the daily diary of student.

Remaining 100 marks are assigned to the presentation and viva-vice of students in front of External examiner.

6 SUGGESTED STUDENTS ACTIVITIES

I) Aspects to be considered for Industrial Training / report writing.

- To be familiar with industrial working environment.

- Planning, preparation & quality control for various activities and processes.
- Management of materials, labors & equipments,
- To solve the minor industrial problems.
- Develop the Entrepreneurial skills.
- Develop ability to work in a team.
- To enhance the presentation skills
- Project reports preparations & cost analysis,
- To be familiar with financial sources.

II) Suggested Areas for the Industrial Training Work: AUTOMOBILE ENGINEERING GROUP

SR. NO	AREA OF AUTOMOBILE ENGINEERING	SUGGESTED ORGANIZATION
1	Automobile Component Manufacturing Sector	Tier- 0.5 A Tier 0.5 supplier that offers brand-independent engineering and manufacturing services to different OEMs. Tier-1 A tier one company is the most important member of a supply chain, supplying components directly to the original equipment manufacturer (OEM) that set up the chain. Teir-2 A tier is the firms which do not supply their products directly to OEM's. They are expert in their filed and they supply product to many other companies also. Tier-3 Tier 3 refers to suppliers of raw, or close-to-raw, materials like metal or plastic. OEMs, Tier 1, and Tier 2 companies all need raw materials
2	Automobile Manufacturing Sector	4 W Manufacturing Industries 2W Manufacturing Industries SPV Manufacturing Industries
3	Automobile Service & Repair Sector.	Authorized 4W Service & Repair Industries Authorized 2W Service & Repair Industries Authorized SPV Service & Repair Industries

4	Transport Sector.	Fleet Maintenance Management Traffic Management

7 SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Consider Local / Institute problem or problem related to society for providing technical solution.
ii. Visit the site.
iii. Take permission of concerned authority.
iv. Follow Instructions.
v. Write daily dairy regularly at site.
vi. Prepare sketches on dairy / on plain pages.
vii. Collect drawings and leaflets.
viii. Group discussions.
ix. Prepare report.
X Prepare power point presentation for final assessment of Industrial Training.

A) STUDENT REGISTRATION & UNDERTAKING FORMAT

Date:

PHOTO

To,

The

Resp. Head of the Department,

Automobile Engineering Department,

Government Polytechnic, Aurangabad.

Sub: - To grant permission for attending industrial training programme at ----------

---------- ----------MIDC: ----------

PLOT NO.:----------DIST: ----------PIN CODE: ---------- ----------

DURATION: Industrial Training from ---------- To ----------

R/Sir,

With reference to above subject I ----------

----------Enrollment no ----------of Semester---------- want to undergo industrial training at ----------

During ---------- To ----------

Sir I assure you that I shall follow all safety Precautions while working in industry and during the daily journey from home to industry. If any incident happens due to lack of my safety precaution, for that incident I am solely responsible. For this Industrial Training I have taken permission from my parents and they are fully aware of it.

Please grant the permission to attend industrial training.

Thanking you. Yours sincerely

Sign:

Parents Details	Students Details
Name of Parent:-	Name of student:-
Address:	Address:
Mobile No	Mobile No
Sign with Date:	Sign with Date:

B) INDUSTRIAL TRAINING REPORT FORMAT

Term work shall consist of a compressive report based on his or her observation. The industrial training report shall include all the points mention below.

1. Cover page
2. Index
3. Certificate by industry (Training completion certificate)
4. Acknowledgement.
5. Industry History.
6. Product / Services details.
7. Organizational structure and plant layout.
8. Safe working practices followed in the industry.
9. Daily task report (day wise as per daily diary)
10. Project undertaken during training, detailing with outcome.
11. Conclusion (include major learning from the training).

It is important that the procedures listed below be carefully followed by all the students. Prepare 2 COPIES of your Industrial Training report (Student copy + Institute Copy).

a. Report must content information related to concerned industry.
b. Header For e.g. GP Aurangabad, Automobile Engineering Dept. Industrial Training (Times New Roman 10 pt. and left aligned)
c. Page number as second line of footer, Times New Roman 10 pt, right aligned
d. Print the report using
   - Letter quality computer printing.
   - The main part of report should be Times New Roman 12 pt. and justified.
   - Use 1.5 line spacing.
   - Entire report shall be one chapter. No chapters for Industrial Training report.
e. Use the paper size 8.5'' × 11'' or A4 (210 × 197 mm). Please follow the margins as given; Margin Location Paper 8.5"× 11", Paper A4 (210 × 197 mm), Top 1" /25.4 mm, left 1.5" / 37 mm, Bottom 1" /25.4 mm, Right 1" / 25.4 mm.
f. All paragraphs will be 1.5 lines spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.
g. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.
h. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).
i. Report content must be correlated with daily diary of the student.
j. Binding: Spiral binding with white transparent plastic cover.

C) DAILY DAIRY FORMAT

GOVERNMENT POLYTECHNIC, AURANGABAD

Automobile Engineering Department

INDUSTRIAL TRAINING DAILY DAIRY

Period of Industrial Training: From:- To:-

Address of Industry / Site: ----------

DAY NO: Date:

Sr. No.	Task of the Day	Nature of Task (Technical / Administrative)	Completion of task			Grade of Supervisor
			Partially	Fully	Not Attainted	
Overall grade for a day(Average) (Note: Industrial guide should assign marks on the basis of 10* point scale; for assessment students Punctuality, Knowledge, Leadership, Task completion and Behavior can be considered) * 1-2:Poor, 3-4:Satisfactory, 5-6:Good, 7-8:Very Good, 9-10:Excellent						

OBSERVATIONS OF THE DAY

(Details of corresponding task in a day)

1. **2.**

3. **4.**

Any suggestion / Remarks to students from industry guide:

Signature of Student **Signature of Industrial Guide**

Enrt. No. **Signature of Institute Guide**

D) WEEKLY VISIT REPORT FORMAT

During the weekly institute visit of student teacher have to maintain their record in following format.

1. Name of student: ----------Enrollment No.:-.....

2. Name of industry:-.....

Sr. No.	Incidents / Activities Observed	Training Weeks														Average marks obtained Out of --- Weeks	Marks obtained out of 30
		1	2	3	4	5	6	7	8	9	10	11	12	13	16		
1	Average grade of each week assign by industrial guide																
Sr. No.	Incidents / Activities Observed	1	2	3	4	5	6	7	8	9	10	11	12	13	16	Average marks obtained Out of --- Weeks	Marks obtained out of 20
2	Interaction with student about work performed by him / her in each week.																
Total Term Work Marks out of 50																	

Signature of Institute Guide

E) EVALUATION FORMAT OF INDUSTRIAL TRAINING:

1ST AND 3RD MONTH COMPLETION PRESENTATION AT INSTITUTE

Sr. No.	Name of Student	Enrollment Number	Presentation	Date of Presentation	Marks Obtained in **Each** Presentation (out of 50)					Total Marks Obtained (out of 100)
					Content Covered (10)	Extent & relevance of work undertaken (10)	Clarity in presentation (10)	Q/A (10)	Task / Project / Experiences shared (10)	
			1st							
			3rd							
			1st							
			3rd							
			1st							
			3rd							
			1st							
			3rd							
			1st							
			3rd							

Name and Signature of faculty ……

8 SUGGESTED LEARNING RESOURCE

Visit to institute library to find the related text books.

Sr No	Title of Book	Author / Publication
1	As per site details / area of Industrial Training.	Refer Books , I.S. Codes, Hand Books , Standard specifications, Manuals of Govt Depts, National and Inter-national journals.

10. Major Equipment/ Instrument with Broad Specifications

1. Daily Dairy write up and taking signature of In-charge Engineer.
2. Interactions with Manager, Engineers, Technicians, and Labors in Industry.
3. Report preparation and Final presentation of Industrial training.

11. Learning Websites

Search on WEB for related manufacturing / Industrial sites.

1. http://www.engineeringtoolbox.com/
2. http://www.howstuffworks.com/
3. http://www.siamindia.com/
4. Websites of respective industry under whom training activity undertaken.

12. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

CO. NO.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	No. of hours allocated in curriculum
	1. Identify the	--	3	--	3	--	--	--	--	--	--	--	2	04

CO 1	manufacturing processes in industry and develop spirit of enquiry in group								-					
CO 2	2. Collect the data and write daily reports of the work on site along with sketches / drawings	--	1	--	---	--	--	--	-- -	---	--	--	2	04
CO 3	3. Observe problem solving techniques at site by the Engineer In-Charge	---	- -	3	3	-- -	---	--	1	--	--	1		08
CO 4	4. Observe manpower requirement according to work allotted and skill required.	--	2	3	--	--	--	---	--	--	--	2	2	04
CO 5	5. Observe the facilities such as arrangement of water, Electricity and Machineries at site.	--	3	--	--	--	--	--	2	--	--	2	2	04
CO 6	6. Learn the different processes, their costing and designs by referring details / drawings.	--	3	3	---	--	---	---	-- -	--	--	--	2	04
CO 7	7. Prepare and present the report of Industrial Training work.	03	- -	--	--	--	--	--	--	03	--	0 3	03	04

Sr No	Name of the faculty members	Designation and Institute
1	Shri. A. W. Nemade	Lecturer in Mechanical Engineering, I/C Head of the Department Automobile Engg. Govt. Polytechnic, Aurangabad
2	Shri. D. D. Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- SEMINAR

COURSE CODE 6A501

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

Seminar belongs to diversified courses category (level) in which consolidation of contents that students study in various earlier courses is expected. Further it expects students to practice certain generic skills viz. working in teams, problem solving, surveying literature, reading and comprehending it and presenting it in proper form. Moreover it provides students opportunity of writing and creating new body of knowledge which are considered as the highest order skills in this era. At the end this course expects students to prepare a document in the form of report, synopsis, proposal etc that can used for various purposes viz. presenting it, submitting it to sponsor to get finance, use it as a base document for project work to be completed in next term.

2. COMPETENCY

At the end of studying this course students will be able to

"Practice self study strategies towards development of abilities of lifelong learning and communication."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	50
--	02	--	02	--	--	25@	25	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify area of study of his/ her interest
2. Undertake literature survey as per the demand of the area of interest
3. Prepare abstract of various sources of literature for a given topic
4. Identify objectives and hypothesis of a given area of study
5. Prepare a seminar report as per standards
6. Present report on a given topic

5. DETAILED COURSE CONTENTS (Only for reference)

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Topic Identification	1a. Form a team 1b. Use group techniques	1.1 Team work - 1.2 Brain storming/ NGT/ or other techniques to identify Project areas in every team 1.3 Validation of project area 1.4 Division of project areas as per batch size and assigning literature work an individual students
Unit - II Survey of literature	2a. Prepare plan for literature survey 2b. Carry out the survey 2c. Select a document for a given survey of literature	2.1 Statement of survey work 2.2 Identify Key words of the statement 2.3 Prepare table for literature survey 2.4 Primary survey- papers from research journals, proceedings of International/national conferences/ seminars (minimum 3-5 latest papers) 2.5 Secondary survey – Text books and reference books (at least 10) 2.6 Tertiary survey- Handbooks, Abstracts, encyclopedias etc (at least 03) 2.7 Web based survey of authentic literature 2.8 Enquiry with individual experts
Unit - III Preparation of seminar report	3a. Prepare cards for recording 3b. Prepare a seminar report as per institute standard	3.1 Reading and note taking of each material 3.2 Preparing cards for note taking 3.3 Note taking for all material

		3.4 Finalization of seminar report structure 3.5 Report writing 3.6 Submission of Draft report to the a guide for correction 3.7 Finalization of seminar report and submission
Unit - IV Presentation of seminar	4a. Prepare effective media 4b. Present seminar effectively	4.1 Preparation of media 4.2 Mid-term presentation 4.3 End term presentation

6. SUGGESTED SPECIFICATION TABLE FOR SEMINAR ASSESSMENT (ESE)

Unit No	Seminar & delivery attributes	Five point scale				
		1	2	3	4	5
1	Topic clarity & relevance to the project					
2	Extent & relevance of literature survey					
3	Quality of objectives					
4	Quality of seminar report					
5	Clarity in presentation					
6	Way of attend to query					

Scale Legends: 1 – Poor , 2 – fair, 3 – Better 4 - Good 5 – The Best

7. FORMAT FOR PROGRESSIVE TRACKING OF SEMINAR WORK

Week	Date	Details of Discussion on work assigned	Work assigned for next week	Signature of guide
1				
2				
3				
4				
5				
6				
7				
8				

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Interview of experts on topic of seminar

b. Visit to libraries of reputed institute and identify literature

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Guided library experiences
b. Team work
c. Task management
d. Self reliant learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Independent study Techniques	Prof P D Kulkarni	NITTTR Chandigarh
2.	Publication Manual	API	American Psychological Institute
3	Publication Manual	IEEE	Institute Electrical Electronics Engineers
4	Publication Manual	SAE	Society of Automobile Engineers

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1	LAN with internet connection	As per industry standards
2.	Printer	As per industry standards
3	Photo copying machine	As per industry standards
4	Library	As per industry standards

5	Catalogue	As per industry standards
6	Membership of professional bodies and their libraries	As per industry standards

12. LEARNING WEBSITE & SOFTWARE

1. http://www.york.ac.uk
2. http://www.queensu.ca
3. http://www.m.ieee.org
4. http://www.araiindia.com
5. http://www.cirtindia .com
6. http://www.saeindia.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify area of study of his/ her interest	03	03							03			03
2	Undertake literature survey as per the demand of the area of interest	03			03				03	03			
3	Comprehend various sources of literature	03			03					03			
4	Identify objectives of study	03	03									03	03
5	Prepare a seminar report									03	02	03	03
6	Present report	03	03							03			03

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- PROJECT

COURSE CODE 6A502

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

Project belongs to diversified courses category (level) in which consolidation/ integration of contents and abilities that students acquire in various earlier courses is expected. Further it expects students to practice certain generic skills viz. working in teams, problem solving, surveying literature, reading and comprehending it and presenting it in proper form. Moreover it provides students opportunity of writing and creating new body of knowledge which are considered as the highest order skills in this era. Moreover this is a part of a course diad comprises of a project course followed by that on seminar in which extensive literature survey for project work is undertaken in seminar and actual work of project modeling, fabrication, development etc is carried out. This course expects students to prepare a document in the form of dissertation that is to be submitted in partial fulfillment of a condition for award diploma graduation.

2. COMPETENCY

At the end of studying this course students will be able to

Manage project/ new task for development of a new body of knowledge, an artifact or a system.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
--	--	04	04	--	--	100#	50	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Design system/ process/project/ model
2. Develop resources for the project work
3. Model/fabricate project work
4. Test project work and finalize
5. Manage task scientifically and systematically
6. Prepare a project report and present work

5. DETAILED COURSE CONTENTS (Only for reference)

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Topic Identification	1a. Work as a team and a leader 1b. Prepare project plan	1.1 Finalization of project title 1.2 Finalization of the design of the project work 1.3 Division and allocation of project task 1.4 Preparation of plan to undertake task 1.5 Preparation of checks for time bound completion of project
Unit - II Survey of literature	2a. Identify materials and services required 2b. Identify vendors for material, resources and services 2c. Prepare a letter for inviting quotations 2d. Prepare comparative statement on the basis of the quotations 2e. Prepare work order/ supply order	2.1 Identification of resource requirement 2.2 Estimate cost based the requirement 2.3 Proposal for funding – self/ sponsor 2.4 Procurement of material, services 2.5 Prepare bill of material Enquiry with individual experts
Unit - III Preparation of seminar report	3a. Fabricate sub systems 3b. Assemble system 3c. Mount and test the system	3.1 Finalise agency for fabrication – Inhouse/ out sourse 3.2 Fabricate sub systems 3.3 Fabricate system 3.4 Mounting/ assembling system 3.5 Run the system and submission

Unit - IV Presentation of seminar	4a. Identify parameters to be tested 4b. Identify gauges and instruments 4c. Collect data 4d. Analyse data	4.1 Testing of the project 4.2 Observations 4.3 Analysis of the data 4.4 Result and conclusions
Unit – V Report writing	5a. Understand standard report format 5b. Identify chapters for the report 5c. Prepare manuscript of the report 5d. Submit the manuscript to the guide 5e. Prepare final report based draft 1, draft 2	5.1 Refer project report format (available at the department) 5.2 Identify chapters for project report 5.3 Preparation of manuscript of all chapters in particular and project report in general 5.4 Submission of draft report to guide 5.5 Finalization of project report

6. SUGGESTED SPECIFICATION TABLE FOR PROJECT ASSESSMENT (ESE)

Unit No	Project & delivery attributes	Five point scale				
		1	2	3	4	5
1	Topic clarity & relevance to the project					
2	Extent & relevance of work undertaken					
3	Quality of objectives					
4	Quality of project report					
5	Clarity in presentation					
6	Way of attend to query					

Scale Legends: 1 – Poor , 2 – fair, 3 – Better 4 - Good 5 – The Best

7. FORMAT FOR PROGRESSIVE TRACKING OF PROJECT WORK

Week	Date	Details of Discussion on work assigned	Work assigned for next week	Signature of guide
1				
2				
3				

4				
5				
6				
7				
8				
9				
10				

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Interview / Discussion with experts on Project topic.

b. Visit to libraries of reputed institute and identify literature

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Guided library experiences
b. Team work
c. Task management
d. Self reliant learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Independent study Techniques	Prof. P D Kulkarni	NITTTR Chandigarh
2.	Publication Manual	API	American Psychological Institute
3	Publication Manual	IEEE	Institute Electrical Electronics Engineers
4	Publication Manual	SAE	Society of Automobile Engineers

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1	LAN with internet connection	As per industry standards
2.	Printer	As per industry standards
3	Photo copying machine	As per industry standards
4	Library	As per industry standards
5	Catalogue	As per industry standards
6	Membership of professional bodies and their libraries	As per industry standards

12. LEARNING WEBSITE & SOFTWARE

1. http://www.york.ac.uk
2. http://www.queensu.ca
3. http://www.m.ieee.org
4. http://www.araiindia.com
5. http://www.cirtindia .com
6. http://www.saeindia.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Design system/ process/project/ model	--	03	02	--	02	02	03	--	--	03	03	--
2	Develop resources for the project work	--	03	--	03	02	--	--	03	02	--	--	--
3	Model/ fabricate project work	--	--	03	03	--	--	--	03	--	--	--	--
4	Test project work and finalize	03	--	03	03	--	--	--	--	--	--	03	03

5	Manage task scientifically and systematically	03	--	--	--	--	--	--	03	03		03	03
6	Prepare a project report and present work	03	--	--	--	--	--	--	--	03	--	03	03

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- MOTOR VEHICLE DRIVING PRACTICE

COURSE CODE 6A505

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

In various junctures Automobile Engineer is supposed to test riding performance of vehicles in order to provide the vehicle with desired level of maneuverability on the road to the customer. It may be a new vehicle landing down from conveyor or the vehicle serviced. In order to do this he/she needs driving skill.

In order to impart driving skill to budding automobile engineer this course is introduced in the programme as a diversified course.

2. COMPETENCY

At the end of studying this course students will be able to

"**Observe defensive driving practice**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	25
0	-	4	4	--	--	25@	--	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Drive a motor vehicle as per eligibility
2. Test vehicle
3. Exhibit defensive driving
4. Train people for defensive driving
5. Carry out road test for fault diagnosis and testing vehicle after repairs

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Driving theory	1 Use vehicle controls 2 Take precaution while driving at intersections, parking and reversing	1.1 Know your vehicle 1.2 Controls – Hand, foot, other 1.3 Predriving checks & Beginning to drive 1.4 Driving on road and intersections 1.5 Maneuver, reversing and parking 1.6 Priority for certain vehicles
2. Traffic theory	1 Observe safety rules 2 Use proper signs 3Attempt Test of competence as per standards	2.1 Driving regulations 2.2 Hand signals, Traffic signs & Hand signals of Traffic constables/Traffic warden. 2.3 Introduction to automatic light signals. Introduction to road markings. 2.4 Speed regulations on highways and city roads. 2.5 Parking at objectionable places.Some important provisions of the Motor 2.6 Test of competence to drive
3. Light vehicle driving theory	1 Use controls of LMV 2 Set all accessories before marching 3 Exhibit biting and reversing as per standards	3.1 Identification of various parts of the vehicles. 3.2 Pre-driving checks (i) Before sitting on driver's seat, and (ii) After sitting on driver's seal. 3.3 Steering practice —Push and pull method Biting point 3.4 Moving and gear changing 3.5 Stopping: Normal, Emergency 3.6 Developing judgment and anticipation to drive on road.

		3.7 Reversing —In straight & in S bends. Turning about and parking. 3.8 Licensing.
4. Traffic education	1 Observe most appropriate behavior on roads and crossing	4.1 Know your road 4.2 Sight distance 4.3 Road junctions 4.4 Traffic island 4.5 Baypass, subway and overbridge
5. Public relation, fire hazard and first aid for the driver	1 Exhibit appropriate behavior on road in emergency situation	5.1 Some basic aspects about ethical and courteous behaviour with other road users 5.2 Fire-fighting and prevention methods on vehicle. 5.3 Introduction to first-aid Outline of first-aid. 5.4 Structure and functions of the body. Dressings and bandages. The circulation of the blood. 5.5 Wounds and haemorrhage. Haemorrhage from special regions. Shock.
6. Defensive Driving Practice	1 Practice defensive driving practice	6.1 Introduction to defensive driving 6.2 Aggressive driving 6.3 Recognizing and avoiding drunk drivers 6.4 Driving in inclement weather 6.5 Driving about big vehicles

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Driving theory	04	--	--	--	--
2	Traffic theory	04	--	--	--	--
3	Light vehicle driving theory	06	--	--	--	--
4	Traffic education	06	--	--	--	--
5	Public relation, fire hazard and first aid for the driver	06	--	--	--	--
6	Defensive Driving Practice	06	--	--	--	--

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Steering practice	06
2	03	Accelerator practice	06
3	04	Clutch practice	06
4	06	Gear and clutch shifting practice	06
5	06	Practice for all aspects	04
6	05	Practice to handle other controls – indicator, head light,	04
7	04	Driving two wheeler	06
8	04	Driving four wheeler	04
9	03	Night Driving	06
10	03	Highway driving and Reversing	08
11	1-6	Mock test for learning license	04
12	1-6	Observe the RTO license tests of two wheeler and four wheeler and prepare a report.	04
		Total practical hours	64

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Observe the RTO license tests of two and four wheeler.

b. Visit the different driving school and study their practices.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

- Driving practice
- Demonstration

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication

1.	MVA		Government Publication
2.	CMVR		Government Publication

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :
    a. Dual control vehicle (LMV)
    b. Cut section of various assemblies
    c. Charts
    d. Driving simulator

12. LEARNING WEBSITE & SOFTWARE

1. http://www.mahatranscom.in
2. http://www.morth.in
3. http://www.sarathi.nic.in
4. www.rtopune.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Drive a motor vehicle as per eligibility		3		3	2							3
2	Test vehicle		2		3	3							3
3	Exhibit defensive driving		3		3	3							2
4	Train people for defensive driving		2		2	3							3
5	Carry out road test for fault diagnosis and testing vehicle after repairs		3		3	2							3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- MOTOR VEHICLE DRIVING PRACTICE

COURSE CODE 6A505

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

In various junctures Automobile Engineer is supposed to test riding performance of vehicles in order to provide the vehicle with desired level of maneuverability on the road to the customer. It may be a new vehicle landing down from conveyor or the vehicle serviced. In order to do this he/she needs driving skill.

In order to impart driving skill to budding automobile engineer this course is introduced in the programme as a diversified course.

2. COMPETENCY

At the end of studying this course students will be able to

"**Observe defensive driving practice**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	25
0	-	4	4	--	--	25@	--	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Drive a motor vehicle as per eligibility
2. Test vehicle
3. Exhibit defensive driving
4. Train people for defensive driving
5. Carry out road test for fault diagnosis and testing vehicle after repairs

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Driving theory	1 Use vehicle controls 2 Take precaution while driving at intersections, parking and reversing	1.1 Know your vehicle 1.2 Controls – Hand, foot, other 1.3 Predriving checks & Beginning to drive 1.4 Driving on road and intersections 1.5 Maneuver, reversing and parking 1.6 Priority for certain vehicles
2. Traffic theory	1 Observe safety rules 2 Use proper signs 3Attempt Test of competence as per standards	2.1 Driving regulations 2.2 Hand signals, Traffic signs & Hand signals of Traffic constables/Traffic warden. 2.3 Introduction to automatic light signals. Introduction to road markings. 2.4 Speed regulations on highways and city roads. 2.5 Parking at objectionable places.Some important provisions of the Motor 2.6 Test of competence to drive
3. Light vehicle driving theory	1 Use controls of LMV 2 Set all accessories before marching 3 Exhibit biting and reversing as per standards	3.1 Identification of various parts of the vehicles. 3.2 Pre-driving checks (i) Before sitting on driver's seat, and (ii) After sitting on driver's seal. 3.3 Steering practice —Push and pull method Biting point 3.4 Moving and gear changing 3.5 Stopping: Normal, Emergency 3.6 Developing judgment and anticipation to drive on road.

		3.7 Reversing —In straight & in S bends. Turning about and parking. 3.8 Licensing.
4. Traffic education	1 Observe most appropriate behavior on roads and crossing	4.1 Know your road 4.2 Sight distance 4.3 Road junctions 4.4 Traffic island 4.5 Baypass, subway and overbridge
5. Public relation, fire hazard and first aid for the driver	1 Exhibit appropriate behavior on road in emergency situation	5.1 Some basic aspects about ethical and courteous behaviour with other road users 5.2 Fire-fighting and prevention methods on vehicle. 5.3 Introduction to first-aid Outline of first-aid. 5.4 Structure and functions of the body. Dressings and bandages. The circulation of the blood. 5.5 Wounds and haemorrhage. Haemorrhage from special regions. Shock.
6. Defensive Driving Practice	1 Practice defensive driving practice	6.1 Introduction to defensive driving 6.2 Aggressive driving 6.3 Recognizing and avoiding drunk drivers 6.4 Driving in inclement weather 6.5 Driving about big vehicles

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Driving theory	04	--	--	--	--
2	Traffic theory	04	--	--	--	--
3	Light vehicle driving theory	06	--	--	--	--
4	Traffic education	06	--	--	--	--
5	Public relation, fire hazard and first aid for the driver	06	--	--	--	--
6	Defensive Driving Practice	06	--	--	--	--

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Steering practice	06
2	03	Accelerator practice	06
3	04	Clutch practice	06
4	06	Gear and clutch shifting practice	06
5	06	Practice for all aspects	04
6	05	Practice to handle other controls – indicator, head light,	04
7	04	Driving two wheeler	06
8	04	Driving four wheeler	04
9	03	Night Driving	06
10	03	Highway driving and Reversing	08
11	1-6	Mock test for learning license	04
12	1-6	Observe the RTO license tests of two wheeler and four wheeler and prepare a report.	04
		Total practical hours	64

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Observe the RTO license tests of two and four wheeler.

b. Visit the different driving school and study their practices.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

- Driving practice
- Demonstration

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication

1.	MVA		Government Publication
2.	CMVR		Government Publication

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :
    a. Dual control vehicle (LMV)
    b. Cut section of various assemblies
    c. Charts
    d. Driving simulator

12. LEARNING WEBSITE & SOFTWARE

1. http://www.mahatranscom.in
2. http://www.morth.in
3. http://www.sarathi.nic.in
4. www.rtopune.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Drive a motor vehicle as per eligibility		3		3	2							3
2	Test vehicle		2		3	3							3
3	Exhibit defensive driving		3		3	3							2
4	Train people for defensive driving		2		2	3							3
5	Carry out road test for fault diagnosis and testing vehicle after repairs		3		3	2							3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE SYSTEM TECHNOLOGY

COURSE CODE 6A406

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

A motor vehicle represents a class of engineering system, as it evolved for the sake of providing primarily comfort a convenience to a mankind. 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. system & all sub Systems associated.

This is Advance Technology course that deals with construction and working of Auto. System in general and its sub systems in particular that equip AET to deal with them satisfactorily.

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyze given Auto system**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Analyze different motor vehicles for their Systems requirement
2. Identify critical dimensions of Systems Aggregates of a given vehicle
3. Analyze Systems of a given vehicle viz. construction, Suspension, Brakes, etc
4. Describe & supervise Systems repairs considering for safety aspects
5. Describe & supervise Work shop activity
6. Diagnosis faults in given Vehicle Systems

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
UNIT I Safety System – Brake Systems	1Explain Brakes specification of any vehicle 2Inspect a Brakes for its dimensions 3.Compare two similar vehicle with reference to their Brake Actuations	1.1 Functions and necessity Legislative requirement 1.2 Classification of brakes and braking 1.3 Principle, construction and working of -disc brakes, drum brake 1.4 Principle, construction and working of Servo (Booster Assy). 1.5 Construction and working of the following-- Mechanical braking system, Hydraulic Braking system, Air braking system, Hydraulic operated air assisted braking system, Hydraulic operated vacuum assisted braking system 1.6 Properties of brake fluids and their specifications 1.7 Concept and working of antilock braking system(ABS 1.8 Parking brake
UNIT II Safety System – Front Axle And Steering System	1. Describe & Identify various Axles in Vehicle 2. Measure Specification of Caster ,camber ,Toe-in Values of a vehicle 3 Describe effect of steering on acceleration and stability of a vehicle	2.1 Types of front axle - Dead axle, live axle, type of stub axle arrangements- Elliot, reverse Elliot, lamoine, reverse lamoine. Transaxle 2.2 Front wheel assembly 2.3 Steering geometry – Caster, camber, king pin inclination, toe in toe out, Correct Steering angle.

		2.4 Under steering and over steering, Turning radius & its effect 2.5 Construction, working & application of Steering gear box – rack and pinion type, recalculating ball type, worm & roller type 2.6 Steering linkages & steering column. 2.7 Ackerman Principle & linkage. 2.8 Power assisted steering & its types And Electronic steering system..
UNIT III Comfort System :Suspension System	1. Explain Suspension its specification of different Automotive 2 Inspect a vehicle for its dimensions 3 Prepare list of various suspension components Guidelines supplied by OEM 4 Inspect given LMV,HMV vehicle as per Indian Standards	3.1 Types of suspension systems, Rigid & independent suspension 3.2 Types of Independent suspension system-McPherson strut, wishbone type 3.3 Semi-elliptical Leaf spring, coil spring, torsion bar arrangement 3.4 Telescopic shock absorber, Gas filled shock absorber, hydraulic shock absorber 3.5 Anti roll bar, stabilizer bar 3.6 Semi-elliptical Leaf spring, coil spring 3.7 Air Suspension System
UNIT –IV Comfort System :Car Heating Ventilation & Air Conditioning System **(HVAC)**	1 Read standard HVAC specification of a car 2.Estimate cost of repair of HVAC system 3 Test a given car for leakage testing	4.1 Basic principle- vapour compression cycle, layout and operation of HVAC 4.2 Types of refrigerant used in car air conditioning and their Properties 4.3 Human comfort conditions 4.4 Climate Control. Temperature control system, humidity control
UNIT- V Security & Convenience Systems	1 Identify various system Security and Convenience systems of a given car	5.1 Power Windows 5.2 Power Sunroof 5.3 Seat & Steering – column adjustment 5.4 Central Locking Systems 5.5 Navigation Systems 5.6 Vehicle information systems 5.7 Signaling and theft-deterrent devices
UNIT-VI Vehicle Performance	1.Measure performance of the vehicle 2.Compare stability of the vehicle of two different vehicles	6.1 Resistance faced by the vehicle- Air resistance, Rolling Resistance, gradient resistance 6.2 Define traction, tractive efforts, draw bar pull, gradiability and Acceleration, pitching, Bouncing

		Rolling and yaw 6.3 Stability of vehicle on turn and slopes.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Safety System –Brake Systems	06	04	06	06	16
2	Safety System –Front Axle And Steering System	08	04	06	06	16
3	Comfort System :Suspension System	10	04	06	06	16
4	Comfort System :Car Heating Ventilation & Air Conditioning System (HVAC)	08	02	04	06	12
5	Security & Convenience Systems	08	04	02	04	10
6	Vehicle Performance	08	02	04	04	10
	Total	48	20	28	32	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	02	Open the steering gearbox, observe the components and steering linkages, sketch and assemble	04
2	01	Observe and draw layout of hydraulic braking system. Open master cylinder, wheel cylinder, and brake drum. Observe and sketch the components.	06
3	01	Observe and draw the layout of Hydraulically operated air assisted braking system	04
4	03	Open, observe and sketch leaf spring and assemble	04
5	03	Dismantle telescopic shock absorber, observe and sketch its components	04
6	03	Observe and draw the layout of air suspension system.	02
7	1-6	Visit to body building and body manufacturing industry, prepare a report considering following points – layouts, body construction, body materials, body repair and painting procedure.	06

8	04	Observe and draw the layout of car air- conditioning. Measure temperature at various places	02
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Visit to Various Automobile Service Stations

b. Collect the failure components of Brake, Suspension, steering etc.

c. Seminar on Vehicle Performance.

d. Survey of Workshop for layout, equipment, machines, tools, gauges related with the Brakes, Suspension, and Steering etc.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Motor Automotive Technology	Anthony Schwaller	Delmar Publisher Inc.
2.	Automotive Service	Tim Gills	Delmar Publisher Inc.
3	Automobile Engineering Vol. II	Anil Chikara	Satya Prakashan New Delhi
4	Automobile Mechanics	Crouse / Anglin.	TATA McGRAW – HILL
5	Automobile Engineering Vol.I	Kirpal Singh	Standard Publication

6	Automobile Engineering	R.B. Gupta	Satya Prakashan New Delhi

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Tool Kit & Standard tools.	As per industry specification
2.	Standard tools for suspension system	As per industry specification
4	Standard tools for Brake system	As per industry specification
5	Standard tools for Comfort /Convenience system	As per industry specification
6	Cut Section Model of ABS vehicle	As per industry specification
7	Cut Section model of Suspension system	As per industry specification

12. LEARNING WEBSITE & SOFTWARE

a. https://hercules.in
b. https://bsahercules.com/
c. www.herocycles.com
d. www.cosmobikeshow.com/en
e. http://www.allrefer.com/15-extremely-popular-bicycle-brands-world
f. http://www.letour.com/us/
g. www.shimano.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

CO No.	Course Outcome	Programme Outcome										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02

1	Differentiate different motor vehicles for their Systems requirement		03	03	03			02					02
2	Identify critical dimensions of Systems Aggregates of a given vehicle		03	03	02								03
3	Analyze Systems of a given vehicle viz. construction, Suspension ,Brakes, etc.		03			02		02					03
4	Describe & Supervise a Systems repairs considering for safety aspects		03	03	03			02					03
5	Describe & Supervise Work shop activity		03	03	03			03					02
6	Diagnosis faults in given Vechicle Systems		03							02	03		01

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOTIVE MECHATRONICS

COURSE CODE 6A508

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

This is one of the Advance Technology (AT) courses. The integration of electronics and electrical systems with mechanical systems is not only used in manufacturing systems but now a days this is also extensively used in various engineering systems for making them ever increasingly efficient, effective, safe, comfortable, convenient, reliable & environment friendly. This is not possible using either of the systems independently Motor vehicles is not an exception to this generic. As Automobile Engineering Technician (AET) deals with such interdisciplinary solutions she/he is required this body of knowledge.

2. COMPETENCY

At the end of studying this course students will be able to

"**Compare and justify need of automotive mechatronics systems over conventional system of Automobile**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Justify the need of integration of electrical and electronics in a modern automotive systems.
2. Compare conventional mechanical system over modern power train system.
3. Identify and Locate comfort system and subsystem in given vehicle.
4. Compare conventional mechanical system over modern convenience and security system.
5. Compare conventional mechanical system over modern wired system

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Automotive Mechatronics	1a. Describe importance of intra and inter system integration. 1b. Compare function of different sensors and actuators.	1.1 Introduction 1.2 Necessity 1.3 Intra & Inter System integration towards optimization of performance. 1.4 ECM and PCM memory devices: POM, PROM, EPORM, EEPORM. 1.5 Input Output Device with RAM. 1.6 Memory circuits: Flip Flops, Buses & Registers. 1.7 Pulse width Modulation. 1.8 Type of automotive sensors and actuators. (Principle of application, location, reliability, cost etc.)
Unit - II Mechatronics of power transmission system	2a. Compare modern power train system over conventional system. 2b. Describe role of intra and inter system.	2.1 Introduction. 2.2 Necessity 2.3 Components / Systems – Engine, transmission (DSG, AMT, Fully Automatic, CVT-i) final drive, axles & Wheel. 2.4 Intra – Inter systems integration (block diagram of control module) 2.1 Advantages of power train mechatronics
Unit - III Mechatronics of comfort system	3a. Justify the need of comfort system in modern vehicle 3b. Describe the construction and working of modern comfort system.	3.1 Introduction 3.2 Necessity 3.3 Systems/components –Climate control systems, Seat comfort systems (auto adjustment by

		pneumatic seat control and heated and climate control seat) ESP and Vehicle dynamics control system (suspension system, aerodynamic features and tire care system) 3.4 Intra – inter system integration (block diagram of control module). 3.1 Advantages & disadvantages.
Unit - IV Mechatronics of convenience, safety and security system	4a. Justify the need of convenience, safety and security system in modern vehicle 4b. Identify and Locate convenience, safety and security system in a given vehicle. 4c. Describe construction and working of modern convenience, safety and security system.	4.1 Introduction 4.2 Necessity 4.3 Systems / Components – ABS, TCS, GPS, Hill assist control, Adaptive cruise control system, Power steering, parking assist, button start, keyless entry, four wheel steer system, follow me home function of headlamp, Air bag, anti pinch protection, Autonomous braking system, central locking, anti-theft system, engine immobilizer system, biometric access. 4.4 Intra – inter system integration (block diagram of control module). 4.5 Advantages & disadvantages of safety mechatronics.
Unit – V Mechanics of Wire Systems.	5a. Justify the need wired system. 5b. Identify and Locate prime components of wired system. 5c. Distinguish between conventional mechanical and modern wired system.	5.1 Introduction 5.2 Necessity 5.3 Component/systems- Steer by wire, Brake by wire, Acceleration by wire etc. 5.4 Intra – Inter systems integration (block diagram of control module). 5.5 Advantages & Disadvantages.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to automotive Mechatronics	10	04	10	04	18
2	Mechatronics of power transmission system	08	05	06	04	15
3	Mechatronics of comfort system	08	05	06	04	15
4	Mechatronics of convenience and security system	13	06	06	04	16
5	Mechanics in Wire Systems.	09	04	08	04	16
	Total	48	24	36	20	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Identification of Basic electronic Components of identified vehicle.	02
2	01	Sensors identification & testing (Standalone & system)	02
3	01	Identify and diagnose an actuator and sensor using autotronics trainer kit, simulate the circuit for idle air control valve or any other autotronics application.	02
4	02	Demonstrate drive train control system of an identified vehicle	04
5	02	Demonstrate transmission control systems (TRCS) of an identified vehicle	02
6	02	Demonstrate Engine control systems of an identified vehicle	02
7	03	Demonstrate Electronic stability programmed of an identified vehicle.	02
8	03	Demonstrate Climate control systems of an identified vehicle.	02
9	03	Demonstrate Vehicle dynamics control system of an identified vehicle.	04
10	04	Demonstrate Electronic power steering control systems an identified	02
11	04	Demonstrate GPRS system of an identified vehicle	02
12	04	Demonstrate Air bag inflation control systems an identified vehicle	02
13	05	Demonstrate Steer by wire system of an identified vehicle	02
14	05	Demonstrate Brake by wire system of an identified vehicle	02

		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Comparative study between any two modern vehicles from same class such as engine specification, power transmission, comfort, convenience, safety, security and economy.

b. Survey in the form of customer feedback forms in order to grade their vehicle (individual).

c. Seminar and report writing on any recent technology (convenience, safety, comfort etc.) in the field of Automobile Engineering (in a group of two students)

d. Market survey on a new development in the field of convenience, safety, comfort and security etc.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Automotive Mechatronics : Operational and Practical Issues	Fijalkowski B.T.	Springer
2.	Mechatronics	Singh M.D. & Joshi J.G.	Tata McGraw Hills publication
3	Computerized Engine controls	D.H. King & G.R. Watson	Thomson Delmar Learning

4	Diagnosis and troubleshooting of Automotive systems	J.D. Haldermann	Prentice Hall

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Demonstration board of various automobile sensors.	As per automotive slandered specification
2.	Demonstration board of various actuator used in automobile.	As per automotive slandered specification
4	Engine scanner.	As per automotive standered specification
5	Oscilloscope	As per automotive standered specification

12. LEARNING WEBSITE & SOFTWARE

a. http://www.continental-automotive.com
b. http://www.howstuffworks.com
c. http://www.webelements.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Justify the need of integration of electrical and electronics in a modern automotive systems.	-	3	-	2	2	-	-	-	-	-	2	3
2	Compare conventional mechanical system over modern power	-	3	-		3	3	-	-	-	-	-	2

	train system.												
3	Identify and Locate comfort system and subsystem in given vehicle.	-	3	1	2	3	1	-	-	-	-	-	3
4	Compare conventional mechanical system over modern convenience and security system.	-	3	1	2	3	1	-	-	-	-	-	3
5	Compare conventional mechanical system over modern wired system	-	3	1	2	2	3	-	-	-	-	-	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE HVAC TECHNOLOGY

COURSE CODE 6A509

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Fifth

1. RATIONALE

Modern cars, Multi-utility vehicles, heavy passenger and goods vehicles are equipped with "heating ventilation and air conditioning (HVAC) system". Air Conditioning system not only provides comfort but also ultimately results in road safety. Air Conditioning servicing, therefore offers good job opportunities for diploma engineers. The prerequisite for this course is Heat Power engineering and Hydraulics and Pneumatics in earlier semester. This course will make student to understand and apply the knowledge in servicing various systems and subsystems of Air Conditioning.

2. COMPETENCY

At the end of studying this course students will be able to

a) Supervise Auto Air-conditioning Workshop

b) Diagnose fault and supervise the work of repairs and maintenance of auto air-conditioning technology"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE**- End Semester Examination**; PT – Progressive Test, PA**- Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. State and Write the refrigeration cycle and methods of refrigeration used in Automobiles.
2. Compare and Order refrigerants with their applications.
3. Examine and Distinguish components of refrigeration system in automobile
4. Create and Prepare load estimation for vehicles in Automobile Engineering
5. Test and rate Car air conditioning and air distribution.
6. Design and Recommend the refrigeration system for vehicle in automobile Engineering

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1. Introduction to Automotive Air-conditioning System	1. Explain environmental and safety aspects in air Conditioning. 2. Explain Human comfort.	1.1 Introduction- 1.2 Environmental and safety aspects in heating, Ventilation and air conditioning systems. 1.3 Human comfort control - comfort zone, air movement, wind chill factor, odour problems and effects of humidity. 1.4 Heat transfer fundamentals-convection, radiation, evaporation and conduction. 1.5 Requirements of heating, ventilation and air conditioning system 1.6 Light motor vehicle 1.7 Heavy goods vehicle 1.8 Heavy passenger vehicle 1.9 Controlled and uncontrolled ventilation - working, application and comparison.
2.Case and Duct System	1. Describe Air intake section. 2. Describe Downstream, upstream, split and hybrid. 3. Describe rear heating and cooling system.	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. 2.3 Construction and working of rear heating and cooling system
3.Air Conditioning System	1. Explain automotive Air Conditioning system 2. Explain refrigeration sub	Part A 3.1 Layout and Sub systems- General layout of Automotive Air

	system. 3. Explain expansion devices. 4. Explain compressors. 5. Compare refrigerants. 6. Explain metering devices.	conditioning system. Construction and working of following refrigeration sub systems Thermostatic expansion valve, fixed orifice tube and rotary vane air cycle system. 3.2 Construction and working of evaporator, condenser, accumulator, 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 Colour code and purity test **Part B** 3.5 Construction and working of electromagnetic clutch 3.6 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. 3.7 Functions of thermostatic expansion valve i.e. Throttling action, modulating action and controlling action. Construction and working of remote bulb.
4. System Control Devices	1. Explain various control devices use in automobile refrigeration systems. 2. Explain switches. 3. Explain electronic Climate control system.	4.1 System controls - Construction and working of Typical vacuum system and electronic temperature control system 4.2 Construction and working of vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve and check relays. 4.3 Switches - Construction and working of high- Side temperature switch, low-side temperature switch, high pressure switch, low-pressure switch, pressure regulator, ambient switch and superheat

		switch. 4.4 Sensors- Construction and working of sun load sensor, outside temperature sensor and in car temperature sensors. 4.5 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.
5.Repairs and Maintenance of Air Conditioning System	1. Carry out maintenance of AC 2. Explain service equipment's and tools used I maintenance of AC 3. 5c. Find out Symptoms, Faults, causes and remedies	5.1 Maintenance Of AC Systems- Visual and acoustic check, side glass, leak test, Temperature test, Procedure of charging and discharging. Moisture removal procedure. Service equipment's 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 5.2 Symptoms, Faults, causes and remedies Compressor Electromagnetic clutch. 5.3 Hoses and connectors - construction of system hoses, charging hose with shut off valve and connectors.
6.Comfort Heating System	1. Explain comfort heating system.	6.1 Comfort heating system 6.2 Function 6.3 Construction and working 6.4 Maintenance 6.5 General faults and their remedies

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

UNIT NO	TITLE OF UNIT	TEACHING HOURS	DISTRIBUTION OF MARKS			
			R	U	A	TOTAL MARKS
1	Introduction to Automotive Air-conditioning System	06	00	04	04	08
2	Case and Duct System	10	06	06	06	18
3	Air Conditioning System	09	03	06	06	15
4	System Control Devices	09	06	06	03	15
5	Repairs and Maintenance of Air Conditioning System	06	00	04	04	08
6	Comfort Heating System	08	04	08	04	16
	Total	48	19	34	27	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Observe and draw layout of Automobile Air Conditioning System and sub systems	2
2	2	Observe and Sketch of all types of Duct system.	4
3	3	Perform trial on AC test rig and report the performance	4
4	4	Diagnosis of control systems faults and write causes and remedies.	4
5	5	Identification and use of tools, gauges and equipment for servicing of AC system.	2
6	5	Observe and write the procedure of evacuation and charging of refrigerant from AC system.	4
7	5	Observe and write the procedure of leakage test of AC system.	4
8	1-6	Diagnosis of various running faults in car HVAC and write causes and remedies.	4
9	1-6	Visit to modern garage for servicing of HVAC system. Write a report on the same.	4

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Collect technical specification of AC used in Automobile for Internet.

b. Collect technical data of Eco friendly refrigerants

c. Collect application based, working based model or actual equipment's based videos of any refrigerator component of Automobile engineering.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Seminars**.**
e. Quizzes
f. Mini project

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Principles of Refrigeration	Roy /J. Dosat	Wiley eastern
2.	Refrigeration & Air conditioning	P. N. Ananth Narayan	TMH
3	Practical Refrigeration & Air Conditioning	M. Adithon & S. C. Laroiya	Wiley Eastern
4	Principles of Air conditioning	V. Paull Lang.	C. B. S.
5	Basic Air conditioning	Gerald Schweitzer & A. Ebling vol. 1 & 2	D. B. Tarapurwala
6	Practical Air conditioning & Refrigeration	Audel	D. B. Tarapurwala
7	Refrigeration & Air conditioning	S. Domkundwar	Dhanpatrai
8	Refrigeration & Air conditioning	C. P. Aurora	TMH

9	Auto air Conditions (Vol 6)	Anil Chikara	Satya Prakashan

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED

a. Different types of refrigerator of actual model
b. Chart on types of air conditioning and refrigerator system
c. Images of different types of evaporators, condensers, compressor etc. of actual Model
d. Different types of actual model of condenser
e. Different types of actual model of compressor
f. Different types of layout of air conditioning system

12. LEARNING WEBSITE & SOFTWARE

a. http://www.nptel.com
b. http://www.howstuffworks.com
c. http://www.webelements.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	State and Write the refrigeration cycle and methods of refrigeration used in Automobiles.		3				3					2	2
2	Compare and Order refrigerants with their applications.		3			3	3					3	3
3	Examine and Distinguish components of refrigeration system in automobile		3				3						
4	Create and Prepare load estimation for vehicles in Automobile Engineering		3									3	2
5	Test and rate Car air conditioning and air distribution.					3	3						

6	Design and Recommend the refrigeration system for vehicle in automobile Engineering		3									3	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- LEGAL ASPECT OF MOTOR VEHICLES

COURSE CODE 6A302

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

This is one of the Allied level (AC) courses offered by the programme department. Use of a motor vehicle as an individual transport or using it for business is regulated and monitored using various legal documents prepared and enforced at international, national, and state levels. In order to develop automobile engineering technicians for all aspects viz. technical, legal, financial, social, environmental etc of motor vehicles related activities this allied course is introduced in diploma programme in automobile engineering.

2. COMPETENCY

At the end of studying this course students will be able to

"Analyze legal issues related to a given motor vehicle during its life cycle and regarding its use."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25@	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Appreciate importance of legal aspects in hassle free use of motor vehicle in different settings
2. Apply different provisions motor vehicle related to acts and rule in a given situation
3. Understand cases related to all aspects of motor vehicle
4. Communicate with the authority related to motor vehicle to resolve issues
5. Prepare a case study on an issue
6. Apply provision of factory and shop and establishment act in formation of enterprise

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Legal aspects related to use of Motor vehicles	1a. Locate a section of MVA for a given issue related to a motor vehicle 1b. Select a most appropriate document for a given issue	1.1 Hierarchy of legal documents and their structure 1.2 Classification of legal documents – Level International, national, state, Issues – motor vehicle, transport, workers, infrastructure 1.3 Evolution of legal documents in India, Object & reasons 1.4 Language of legal documents – Sections, sub section, clause, rules and sub rules Hierarchy of legal documents and their structure 1.5 Classification of legal documents – Level International, national, state, Issues – motor vehicle, transport, workers, infrastructure 1.6 Evolution of legal documents in India, Object & reasons 1.7 Language of legal documents – Sections, sub section, clause, rules and sub rules
Unit - II Motor vehicle act and rules I	2a. Analyze an issue related to licencing, registration and permit	2.1 Motor vehicle Act 1988 –sections, subsections related to licencing, registration, control of transport 2.2 Central Motor Vehicle Rules 1989 – rules related to licencing, registration, control of transport, 2.3 State (Maharashtra) Motor Vehicle Rules 1989-rules related to all above aspects of motor vehicles 2.4 Inter relation among the acts and rules related all above aspects

		2.5 Implication of acts and rules over motor vehicle business AND SOCIETY
Unit - III Motor vehicle act and rules II	3a. Analyze any issue related to traffic control, construction of motor vehicles and insurance	3.1 Motor vehicle Act 1988 –sections, subsections related to control of traffic, Construction, equipment and manufacturing of motor vehicles, liability and insurance, offences, penalty and procedure 3.2 Central Motor Vehicle Rules 1989 – rules related to control of traffic, vehicle construction, insurance, and offence 3.3 State (Maharashtra) Motor Vehicle Rules 1989-rules related to all above aspects of motor vehicles 3.4 Inter relation among the acts and rules related to all aspects 3.5 Implication of acts and rules over motor vehicle business AND SOCIIETY
Unit IV Road Transport related act & rules	4a. Analyze a given STU by Applying knowledge of RTA	4.1 Need of RTA 1950 4.2 Road Transport Act 1950 – formation of STU, planning and managing transport business under STU 4.3 Case studies 4.4 Motor Transport Workers Act- Need, Working conditions, welfare and provisions for transport workers, 4.5 Social Implication of RTA and MTWA
Unit - V Bombay and Maharashtra motor vehicle tax act and rules	5a. Calculate tax to be charged in a given situation	5.1 Maharashtra Motor vehicle tax act & rule- need, provisions 5.2 Motor vehicle taxes – road, passenger, goods and environment, criteria, calculation and taxation authority 5.3 OTT and its application 5.4 Tax per day, quarterly tax, half yearly tax, annual tax calculation for passenger and freight transport vehicles 5.5 Social implication of tax
Unit – VI	6a. Use act for analyzing given	6.1 Maharashtra Factory act – need,

Factory, shop and establishment act	organization	provisions, and enforcement 6.2 Maharashtra Shop and establishment act- needs, provisions and enforcement 6.3 Study of auto service entities covered under factory act 6.4 Study of auto service entities under shop and establishment act 6.5 Critical analysis of both

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction	06	04	04	02	10
2	Motor Vehicle act & rule I	10	04	06	08	18
3	Motor vehicle act & rule II	10	04	06	08	18
4	Road transport act & Motor transport workers act	08	02	04	06	12
5	Maharashtra tax act and rule	06	02	04	04	10
6	Factory and shop & establishment act	08	02	04	06	12
	Total	48	18	28	34	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	02	To prepare portfolio for getting Driving license	02
2	02	To prepare portfolio for getting driving school license	02
3	02	To prepare portfolio for getting conductors license	02
4	02	To prepare documents for registration of a given vehicle	02
5	02	To prepare documents for getting Fitness certificate for Transport vehicle	02
6	02	To prepare documents for getting vehicle transferred All cased	02
7	03	To prepare portfolio for getting a permit	02
8	03	Study forms and certificate for insurance with reference to principles of insurance	02
9	03	To prepare a case study of claim settlement in case of real accident	02

10	04	To study critically STU and a private transport organization with reference to organization, working and observations	02
11	05	To prepare a report on tax calculation and payment	02
12	06	Study a given service organization for legal compliance	02
13	02	To prepare portfolio for getting Driving license	02
14	02	To prepare portfolio for getting driving school license	02
15	02	To prepare portfolio for getting conductors license	02
16	02	To prepare documents for registration of a given vehicle	02
		Total	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Visit to local RTO office

b. Visit to four wheeler Service station

c. Seminar on issues related to Registration/ taxation/ claim settlement

d. Survey of organizations

e. Preparation of charts

f. Organization of camp

g. Extension of services to law enforcement authority

h. Organization of Road safety awareness event

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-

b. Q & A technique

c. Group discussion

d. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Motor Vehicle act 1988	Government	Govt of India
2.	Central Motor Vehicle Rule 1889	Government	Govt of India
3	MMVR 1989	Government	Govt of Maharashtra
4	RTA 1950	Government	Govt of India
5	Motor Transport Workers Act	Government	Govt of India
6	Motor Vehicle act 1988	Government	Govt of India
7	Central Motor Vehicle Rule 1889	Government	Govt of India
8	Shop & Establishment Act	Government	Govt of India
9	Compendium of Transport Terms	Government	CIRT Pune
10	Motor vehicle act 1988 with rules	T K Mukharjee	Premier Publishing company

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Computer	As per Auto industry specification
2.	Xerox	As per Auto industry specification
4	Internet	As per Auto industry specification
5	Driving Simulator	As per Auto industry specification
6	Motor Vehicle with Dual control	As per Auto industry specification
7	College bus	As per Auto industry specification

12. LEARNING WEBSITE & SOFTWARE

1. http://www.mahatranscom.in
2. http://www.morth.in

3. http://www.sarathi.nic.in
4. http://www.rtopune.com
5. http://www.rtoaur.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Appreciate importance of legal aspects in hassle free use of motor vehicle in different settings	03				03	--	--	--	--	--	02	03
2	Apply different provisions motor vehicle related to acts and rule in a given situation	03	--	03	--	03	--	--	--	--	--	--	03
3	Analysis cases related to all aspects of motor vehicle	03	--	03	--	03	--	--	--	03	--	--	--
4	Communicate with the authority related to motor vehicle to resolve issues	--	03	03	--	--	--	--	--	03	--	--	03
5	Prepare a case study on an issue	--	03	--	--	--	--	--	--	03	--	03	03
6	Apply provision of factory and shop and establishment act in formation of enterprise	--	03	--	--	03	--	--	--	03	--	--	--

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- INDUSTRIAL ORGANIZATION AND MANAGEMENT

COURSE CODE 6G305

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ME,EE,CE,**AE**,E&TC,CO,IT,DD	Sixth

1. RATIONALE

Diploma graduate works at middle management level in the industries/engineering organizations. Therefore he has to be proficient in planning, organizing & coordinating various activities of industries/ organizations or when he is required to work in different types of projects.

They are also expected to deal with workforce and management problems. In the present era of competition, optimum utilization of the resources with achieving higher productivity is essential for any industry to survive. Quality and cost controls are also other important factors which contribute to the day to day supervision issues. This course aims to deal effectively with such issues along with familiarization of acts and laws applied to industries.

2. COMPETENCY

At the end of studying this course students will be able to

"**Plan, Organize andCoordinate various activities/ processes in industry/projects by ensuring optimal use of resources "**

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE@ (PR/OR)	PA (TW)	125
03	--	02	05	80	20	--	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term. Work, # External, @ Internal,~ Online Examination.

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Plan , Organize and Coordinate various activities in industry or a project.
2. Apply PERT/CPM method for project scheduling of given project
3. Ensure the optimal use of resources.
4. Identify the need of finance and its optimal use in an organization.
5. Manage materials &Stores .
6. Apply marketing strategies to promote the sales &services.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
1.Business overview	1a. Classify businesses. 2a. Outline the impact of Globalization and IPR on business. 3a. Identifyneed of e-commerce.	1.1 Type of sectors. Service, Manufacturing, Trade. 1.2 Globalization and IPR- Introduction, Advantage and Disadvantage w.r.t India. 1.3 e - Commerce: Merits and Demerits.
2. Evolution of Scientific Management.	2a Outline the historical perspective of management. 2b Identify the functions of management. 2c Develop organization structure. 2d Select appropriate form of ownership.	2.1 Evolution of management thoughts. 2.2 Definition of management, levels of management. 2.3 Scientific management by F W Taylor 2.4 Administration vs. Management 2.5 Henry Fayol'sPrinciples of management. 2.6 Functions of management-Planning, Organizing, Staffing, Directing & controlling 2.7 Types of organization- Line, Line& Staff, Functional & Project 2.8 Centralization and decentralization. 2.9 Forms of Ownership- Proprietorship, Partnership, Joint Stock Company, Co-operative society & Government Sector.
3. Personnel Management &Legislative	3a Identify & develop human resource 3b Apply strategies of	3.1 Definition, Objectives and Function of Personnel management 3.2 Recruitment &Selection Procedure 3.3 Training & its type: Induction, Skill

Act.	motivation. 3c Practice safety procedure 3d Identify the features of industrial acts.	Enhancement & Motivation. 3.4 Leadership & its style. 3.5 Motivation-Definition, its type & Maslow Theory 3.6 Safety management: Causes of Accident and Safety procedure 3.7 Salient Features of (Introduction, Objective, Scope, Important definition & Related provision) 1 Indian Factory act 1948. 2 Industrial dispute acts 1947. 3 Workmen compensation act 1923. 4 The employees state insurance Act 1948. 5 Contract Labour Act.
4.Financial Management	4a Identify sources of finance 4b Prepare budget. 4c Acquaint with prevailing taxation policy.	4.1 Objectives & Functions of financial management, 4.2 Capital Generation & Management 4.3 Types of Capitals-Fixed & Working Capital 4.4 Elements of Cost-Direct & Indirect Cost 4.5 Sources of raising Capital-Internal & external sources 4.6 Introduction of budget, budgetary control 4.7Production Budget (including Variance Report) 4.8Labour Budget 4.9Introduction to Profit & Loss Account (only concepts) 4.10Introduction of Income Tax &GST (Good & Service Tax)
5.Materials Management	5a. Plan Inventory for processes . 5b. Calculate EOQ. 5c. Practice purchase procedure.	5.1 Objective and function of material management 5.2 Inventory – Concept , its Classification & Objective 5.3 Economic Order Quantity (EOQ)- Concept & Graphical Representation 5.4 ABC Analysis- Definition & Step 5.5 Purchase Procedure 5.6 Overview of ERP, JIT, 5's Kaizen& six sigma (Introduction, Objective & Benefit).
6.Project	6a Use CPM/PERT for project scheduling for execution.	6.1 Introduction of Project Management, project Network Analysis 6.2 Concept and introduction of CPM/PERT.

Management	6b Track the project with the help of project management techniques.	6.3 Concept of Breakeven analysis. 6.4 Progress tracking charts-bar charts, Gantt charts and histogram. 6.5 Solving simple network using CPM/ PERT
7.Marketing Management	7a. Apply marketing strategies.	7.1 Objective & Function of marketing management 7.2 Sellers and Buyers markets, Marketing, Sales, Selling vs. Marketing, Sales promotion, Marketing Mix, Pricing Policies. 7.3 Marketing Strategies: Segmentation, Targeting & Positioning. 7.4 Marketing Information System.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Business Overview	03	02	04	00	06
II	Evolution of Scientific Management	09	04	10	00	14
III	Personnel Management & Legislative Act	11	04	10	04	18
IV	Financial Management.	07	04	06	02	12
V	Materials Management	06	04	04	02	10
VI	Project Management	07	02	02	08	12
VII	Marketing Management	05	02	04	02	08
	Total	**48**	**22**	**40**	**18**	**80**

Legends:*R– Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able

to acquire the competencies/ programme outcomes. Following is the list of practical exercises for guidance.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

1. Plan, Organize and Coordinate various activities in industry or a project.
2. Ensure the optimal use of resources.
3. Identify the need of finance and its optimal use in an organization.
4. Manage materials &Stores .
5. Apply PERT/CPM method for project scheduling of given project
6. Apply marketing strategies to promote the sales & services.

S. No.	**Unit No.**	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Approx. Hrs. required**
		Part A- Common to all Programmes	
1.	I	To collect data / information and prepare report about business/organization and identify the nature of business and prepare organization structure.	04
2.	III	Identify and propose Safety requirements/ mechanism for an industry .	04
3	V	Prepare a report of inventoryby visiting stores of an industry/organization.	02
4	VI	Prepare network diagram using CPM& PERT (3-4 networks each)) for identified Projects	04

5.	IV/VII	Undertake Survey/Data Collection, Presentation and Data interpretation for following . (Any One) a. Sales Promotion. b. Channel of Distribution c. Capital Generation & Management	04
		Part B- Programme Specific Practical (Five Numbers)	
6	III	Prepare a report on Human Resource (HR) policies used in Multinational companies	02
7	IV	Give presentation(PPT)on various Financial budget of a company	02
8	IV/V/VII	Data collection on i)GST ii) Six sigma iii)Market segmentation	02
9	VII	Discuss Global marketing strategies by making small presentation(PPT)	04
10	All Units	Micro Project (visit to an industry ,observe & prepare a report on various management techniques adopted by the company)	04
Total			**32Hrs**

8. SUGGESTED STUDENTS ACTIVITIES

Sr No	Activities
1	Prepare a group of five students and write qualities of a good leader.
2	Prepare a group of 10 students and conduct a group activity like housekeeping of a class room.
3	Draw a network for given set of activities and identify the critical path
4	Calculate the total time required to accomplish a task when t_e, t_p and t_m is given.
5	Visit to nearest ESIC office and collect information about services provided by ESIC office to the working employees.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

Sr no	Unit no	Unit name	Strategy
1	1	Business Overview	Live explanation, videos.
2	2	Evolution of Scientific Management	Live explanation, , case study
3	3	Personnel Management & Legislative Act	Live explanation, movie, case study
4	4	Financial Management.	Case study, survey, industrial visits
5	5	Materials Management	Net survey, Case study, industrial visits
6	6	Project Management	Net survey, Case study, industrial visits
7	7	Marketing Management	Net survey, Case study, industrial visits

10. SUGGESTED LEARNING RESOURCE

S. No.	**Title of Book**	**Author**	**Publication**
1.	Industrial Organization and Management	O.P.Khanna,	DhanpatRai and Sons
2.	Industrial Organization and Management	Banga and Sharma,	Khanna Publications
3.	Modern Business Organization & Management	S.A.Sherlekar& V.A. Sherlekar,	Himalaya Publications

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED

NIL

12. LEARNING WEBSITE & SOFTWARE

i) https://mitpress.mit.edu

ii) http://iveybusinessjournal.com/publication/a-new-role-for-management

iii) https://en.wikipedia.org/wiki/Project_management

iv) http://www.pmi.org.in/

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs)WITH COURSE OUTCOMES (COs)

SR No	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Plan,Organize,and Coordinate various activities in industry or a project.	03	03	02		03			01			03	
2	Ensure the optimal use of resources.	02	03		02	03			01			02	02
3	Identify the need of finance and its optimal use in an organization	03	03		02						01	03	03
4	Manage materials & Stores	02	03		03							03	
5	Apply PERT/CPM method for project scheduling of given project	01	03		03						02	03	02
6	Apply marketing strategies to promote the sales &services.		03		03			02	02		02	03	

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	A.B.Deshpande	Lecturer in Mechanical Engineering, Govt. Polytechnic, Aurangabad
2	K.S.Borde	Lecturer in Civil Engineering, Govt. Polytechnic,Aurangabad
3	P.B.Lahoti	Lecturer in Computer Engineering, Govt. Polytechnic, Aurangabad

COURSE TITLE- AUTOMOBILE SERVICE MANAGEMENT

COURSE CODE 6A303

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. 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 not only to make customer satisfied once but to convert him into lifelong customer of service center. An individual working with or aspiring to work in service network is therefore required to acquire requisite skills to follow CRM.

2. COMPETENCY

At the end of studying this course students will be able to

"**Use importance of knowing Automobile Service Management and its linkages with Sale through CSI**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Justify the importance of service management in automobile business.
2. Describe roles and work profiles of persons working in a service industry.
3. Describe procedure of JDP customer service index survey.
4. Describe detail project report on establishing a dealership.
5. Prepare service documentation.
6. Prepare a case for financing a four-wheeler

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
1.Introduction to Auto service industry	1. State and explain different types of service centers 2. Describe automobile manufacturers organization structure	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)
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
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	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	improving CSI
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 4.4 Product performance report 4.5 Job card, warranty documents, service bulletin 4.6 Customer data, vehicle history
5.Vehicle financing	1. Enlist documents required for a vehicle financing 2. Define need and procedure of vehicle financing 3. Prepare a finances on various parameters for pre-owned vehicle	5.1 Vehicle financing, Need, type's agencies, types, procedures, documents required, terms & conditions, EMI calculation, interest. 5.2 Valuation of 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** Value added Services viz. Door-step service, pickup & drop facility, Service training, Free Service camps, 24x7 Assistance.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

UNIT NO	TITLE OF UNIT	TEACHING HOURS	DISTRIBUTION OF THEORY MARKS			
			R Level	U Level	A Level	TOTAL MARKS
1	Introduction to Auto service industry	06	02	06	02	10
2	Dealerships organization	10	04	06	06	16
3	Customer satisfaction index	08	04	04	06	14

	(CSI)					
4	Service documentation & management information system	10	02	04	06	12
5	Vehicle financing	08	04	10	00	14
6	Service quality	06	04	06	04	14
	Total	48	20	36	24	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Prepare a detail project report on establishing a dealership for four wheeler or two wheeler	4
2	03	Draw a layout of a service station for LMV/ cars consists of following:- Plan, Elevation Layout, Height, Civil work Structure (brief), Ventilation, Illumination, vehicle parking, Waste disposal, Electrical, Painting, Security, Reception, Front office, Cash counter, Customer lounge, equipment's , Spare parts section , Training room, Lubrication room, mechanical workshop- bays arrangement, Aggregate overhaul, Electrical overhaul room etc.	4
3	04	Fill information (mock) in sample documents of Job card to claim maintenance under warranty.	4
4	06	Prepare a case for financing a four-wheeler.	4
5	06	Visit a free service camp & prepare a report consisting of objective, procedure, activities, layout, expenses & role of various service personnel.	4
6	05	Attained one-two days service training workshop & prepare a report.	4
7	04	Accident vehicle repair section :- Prepare a report on formalities and procedure of accident repairs	4
8	04	Prepare a report on the comparison amongst (i) two wheeler service(ii) car service (iii) heavy commercial vehicle service	4
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey of Automobile CSI Rating

b. Field survey by visiting various Dealers

c. Study of various Organizations Determining CSI rating all over the world

d. Demonstrate their views for most favorable vehicle with scientific reasons

e. Collecting various Service documents for Example: Job Cards, Warranty documents, Dos and Don'ts in Service Management etc.

f. Collection of Various Organization structure existing in Automobile Service Center and find out the base suitable among them.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Customer relationship management	Roger Baran	CristopherZerres, Edition-1 Yr. 2014
2.	Customer relationship management concept, strategy and tools	Springer Texts in business and economics-Edition 3	Springer Yr.2012

3	Workshop Management systems	Tata Motors ltd. Yr. 2011	Nil
4	Service quality standards	Maruti Suzuki ltd. Yr. 2015	Nil
5	Automotive Service management	2nd edition, By Andrew RezinYr. 2013	Nil

11. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** : NIL

12. LEARNING WEBSITE & SOFTWARE

1. http://www.boschautoparts.com
2. http://www.tomdenton.com
3. http://www.toyota.com
4. http://www.india-jdpower.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	Programme Outcome										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Justify the importance of service management in automobile business.								3	2	1		3
2	Describe roles and work profiles of persons working in a service industry								2	3			3
3	Describe procedure of JDP customer service index survey.								3	3			2
4	Describe detail project report on establishing a dealership								2	3			3
5	Prepare service documentation								2	3	1		2

6	Prepare a case for financing a four-wheeler								2	3			2

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- TRANSPORT MANAGEMENT

COURSE CODE 6A304

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

Transport management has acquired huge importance not only due to expansion of a service sector and rise in online purchasing of goods of various types but also due to urban transport issues witnessed. Transport is a vital part of logistics and supply chain management without which nothing can happen. Automobile Engineering Technician having ability to maintain and schedule fleet have great potential for wage and self employment. Hence this allied level course in management is introduced.

2. COMPETENCY

At the end of studying this course students will be able to

"**Manage road transport activities for extending effective, efficient, customer friendly and well coordinated transport services to customers"**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Select a mode for a given transport
2. Identify transport management philosophy of a given transport organisation
3. Plan activities of a passenger transport
4. Plan activities of a freight transport
5. Manage human resource and vehicles for a given transport operation

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	**TOPICS AND SUB-TOPICS**
Unit - I Introduction to transport	1a. Compare different modes of transport 1b. Use legal provision to deal with transport management 1c. Identify authority in sorting a given issue	1.1 Transport–Definition, Importance, different modes of transports – Road, Rail, Air & Sea, Pipe comparison between them 1.2 Introduction to Road transport – Types – Passenger and Freight, characteristics 1.3 Elements of transport- Vehicle, road, workers, terminals etc requirements, characteristics 1.4 Important Legal aspects for transport – The Road Transport Corporation Act 1950 (RTCA), Motor Transport Workers Act 1961 (MTWA), MVA 1988, CMVR 1989 recap about provisions and enforcements 1.5 Govt departments, Organisations and corporations involved in transport activities in India -brief information and their roles – CIRT, STUs/ MoRT&H GOI
Unit - II Key terms related to road transport and its management	2a. Interpret a given term 2b. Differentiate between similar terms 2c. Select a term to calculate a desired performance	2.1 General Rod Transport - definition and significance – Transport vehicle, route, trip, road transport service, motor transport worker, wages, week, hours of work, running time, steering, spread over, motor transport undertaking, permit, area, public place, driver, owner, ancillary service, fitness

		certificate, certificate of registration, OTT, Insurance, Road tax, Permit and its types, MRTS, AWR, FWR, PMGSY, JnNURM 2.2 Road Passenger Transport (RPT) definition and significance of terms- passenger, conductor, contract carriage, educational institute bus, HPMV, maxi cab, motor cab, Omni bus, private service vehicle, public service vehicle, stage carriage, contract carriage, State transport undertaking, tourist vehicle, Load Factor (LF), Earning Per KM (EPKM), Kilometers per Ten Litres (KPTL), Kilometers per litre of engine oil (KPL), Night out, City bus operation, Inter city Operation, Obligatory trip, Schedule, route, Department vehicle, vehicle, micro/ mini/ midi/ standard bus, articulated bus 2.3 Freight/ goods transport - Definition and significance of terms- Goods, Goods Carriage, Gross Vehicle Weight (GVW), Registered Axle Weight (RLW), heavy/ medium/ light goods vehicle (H/M/LGV), Tractor Trailer, Trailer, Semi Trailer, Category M, Category N, bulk, Live stock, 2.4 Traffic terms – definition and significance -Permit, Route, Route length, Trip – schedule, extra, operated, Time table, Schedule – bus & depot, Kilometer – scheduled, average, effective, dead, gross, cancelled, Seat KM Efficiency, peak/ slack/ normal period, seating capacity, Fare – differential, flat, graduated, concessional, single coin, Fare structure, Passenger load, delay,

		late departures/ arrivals, breakdown & rate, accident, peak hour/ period, travel demand management, congestion pricing, fare revenue collection equipment, accident and rate 2.5 Workshop terms – Buses/ Vehicles on road/ spare/ in workshop/ off road/ under repair & idle, Fleet and its utilization, bus days lost, average bus age in yrs, productivity of buses, KMPL, PKMPL, Battery/ tyre/ assembly 2.6 Financial terms – Capital – employed, invested, Capital expenditure, Traffic & Non traffic receipts, Gross revenue, Earning Per Kilometer (EPKM), Earning per seat KM, Revenue Expenditure, Cost -operating/ variable/ fixed/ total/ controllable/ non – controllable, Cost Per KM (CPKM) on fuel/ engine oil & lubricants, operating ratio, expense ratio, Breakeven point, Profit – operating, gross, net, retained, Return on capital employed/ invested, Revenue- operating/ fare/ passenger
Unit - III Introduction to Transport Management	3a. Differentiate between Supply Chain Management (SCM), Logistics and Transport Management (TM) 3b. Identify elements of a given transport 3c. Use MBO and TMS	3.1 Transport management as a sub system of logistics –definitions and difference 3.2 Management of transport – planning, organizing & staffing, implementing, monitoring and controlling transport elements 3.3 Elements of transport – Infrastructure – Terminal, warehouse, Deport, Human resources, Vehicles, Operation – cost, earning, revenue, profit 3.4 Management by Objective in Transport – concept and importance 3.5 Transport Management System (TMS) – introduction and advantages

Unit - IV Management of Road Passenger Transport (RPT)	4a. Identify a given RPT 4b. Plan for RPT 4c. Prepare/ revise mechanism to control and monitor RPT 4d. Calculate performance parameters of RPT	4.1 Introduction to Road Passenger Transport – Requirements, types – Personal, Intermediate and Transit – Bus, light rail & Metro, Rural and urban road passenger transport, City and inter city 4.2 Planning for Road Passenger transport (RPT) – Planning Strategies, network planning, Travel Demand Estimation, routing and scheduling, intermodal coordination, stakeholder consultation and preferences, time table 4.3 Organizing for RPT – Management public and private organization, staff selection – Managerial, supervisory, operation & technical MSRTC as a model organization for RPT, Levels – State, Region, Division and deport, Organisation structure at each level for traffic-operation and Mechanical maintenance 4.4 Operating RPT- Operating Schedules, Trips, and routes as per time table, Issue of vehicle with a logsheet to a driver, Issue of ticket tray/ fare revenue collection equipment, submission of vehicle with filled log sheet and ticket tray/ revenue collecting equipment with revenue to authorities, report 4.5 Monitoring & Controlling RPT – Traffic, mechanical maintenance using General Standing Order (GSO) and Traffic demand inventory (TDI)
Unit - V Management of Road freight transport	5a. Identify a given RFT 5b. Plan for RFT 5c. Prepare/ revise a mechanism to monitor and control RFT 5d. Calculate performance parameters of RFT	5.1 Introduction to Road Freight Transport (RFT)- requirement and types – Goods and bulk, Hazardous goods, Public and private 5.2 Planning for Road Freight transport(RFT)- Business, market, operations, systems, regulatory compliance, vehicle 5.3 Organizing for RFT –

		management, organization structure, staff selection – supervisory, operational and technical, Vehicles – Specifications, Analyzing operations- Operational & technical factors 5.4 Implementing/ Operating RFT-Load Compiling systems, controlling fleet, Scheduling – types, routing patterns, load control, driving hours & accidents, vehicle maintenance, safety and down time 5.5 Monitoring and controlling RFT – Standards, Controlling parameters – time, distance load, Monitoring systems – driver report sheets, tachograph, On board computer, Scanner, CCTV, Auto fueling and recording, and monitoring fleet performance-% Availability, utilization, Payload achieved, Ton hauled per shift, Ton to KM ratio, KMTL, Down time, average age of fleet
Unit VI Advances in Transport Management	6a. Update about TM advances 6b. Identify source of information on TM 6c. Prepare review paper on TM	6.1 Bus Rapid Transit System (BRTS) – concept, construction and benefits 6.2 Global Positioning system (GPS) for tracking of passenger and freight transport vehicles, AVL, RTPI 6.3 Maintenance practices for BSIV and BS VI vehicles 6.4 Built Operate and Transfer (BOAT) – concept, policies and benefits 6.5 Transport Management System (TMS) and Intelligent Transport System (ITS) – concept, framework and benefits in managing transport

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to Transport	04	2	4	--	6
2	Key terms related to road transport and its management	06	2	4	4	10
3	Introduction to Transport Management	06	4	4	2	10
4	Management of Road Passenger transport	12	4	8	8	20
5	Management of Road Freight Transport	12	4	8	8	20
6	Advances in Transport Management	08	2	6	6	14
Total		48	18	34	28	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Study Provisions of Road Transport Act 1950	2
2	1	Study Provisions of Motor Transport Workers Act 1961	2
3	1	Study Role of CIRT, MoST&H, TCI, in road transport	2
4	2	Comprehending Road Transport and its management terms 1	2
5	2	Comprehending Road Transport and its management terms 2	2
6	3	Logistics – scope & importance	2
7	3	Study Intermodal transport management – broad view	2
8	4	Survey Planning & Organising of RPT - report	4
9	4	Survey Operation & monitoring of RPT	4
10	5	Case study of Planning & Organising of RFT - report	4
11	5	Case study Operation & monitoring of RFT	2
12	6	Study of TMS software	2

13	6	Study Advances in Road transport	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey for various STUs

b. Field survey of Freight transport organization

c. Survey of tax compliance of local contract carriages

d. Surfing website of CITR Pune and related institute

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Group discussion
d. Guided library experience
e. Flipped classroom
f. Activity based learning
g. Visits

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Transport Management in India	Kulshrestha D K	Mittal Publication New Delhi
2.	Vehicle Transport Management	Bhandarkar S.L.	Dhanpat Rai & Co, New Delhi
3	Public Transport planning and Management in Developing countries	Ashish Verma T.V.Ramanayya	CRC Press, London

4	Handbook of transport science	Hall RW	Kluwer Academic Publishers New York
5	Compendium of transport terms	CITR	CIRT Publication
6	Management of Road Freight Transport	Nick Poree	Reach Publishers, Wands beck SA
7	Motor Transport Workers Act 1961		Government
8	The Road Transport Corporation Act 1950		Government
9	Fundamental of intelligent Transportation system planning	M A Chowdhary & A Sadek	Artech House London
10	Managing Transport Operations	E J Gubbins	Kogan Page London
11	Management of Road Freight Transport	Nick Poree	Rich Publishers, Wandsbeck SA

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Department library	As per industrial needs
2.	Personal Computers	With latest specification
4	Internet	2 MBPS bandwidth
5	Photo copier	Doc centre
6	Software	TMS, ITS
7	E-books	On Transport and Transport management

12. LEARNING WEBSITE & SOFTWARE

a. www.cirtindia.com
b. www.msrtc.government.in
c. All STUs
d. BEST
e. Transport corporation of India (TCI)
f. www.mort&h.org

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Introduction to Transport	03	03	--	--	--	--	--	--	--	--	--	--
2	Terminology of Transport and its management	--	03	--	--	--	--	--	--	03	03	--	--
3	Introduction to Transport management	--	03	--	--	--	--	--	--	--	03	--	--
4	Management of Road Passenger Transport	--	03	--	03	--	--	03	--	--	03	--	--
5	Management of Road Freight Transport	--	03	--	03	--	--	03	--	--	03	--	--
6	Advances in Road transport Management	--	03	--	03	--	--	--	--	--	03	--	--

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Pratapsingh Jadhav	Retired Mechanical Engineer – Operation(MEO) Maharashtra State Road Transport Corporation (MSRTC)
3	D S Kulkarni	Divisional Transport Officer (DTO), Satara Division, MSRTC, Satara
4	N R Kachare	Dy Director, Central Institute of Road Transport (CIRT) Pune

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTO SERVICING AND REPAIR TECHNOLOGY

COURSE CODE 6A408

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

This is one of the Advance Technology (AT) courses. Over last 2-3 decades service sector has emerged as a main employment provider in almost all sectors and automobile field is not exception to this fact. With the advent of its customer orientation the advanced service and repair technology is being used in terms of machines, equipment, tools and techniques. In order to train budding automobile engineers under such circumstances this compulsory and award of diploma course has been added in the diploma programme.

2. COMPETENCY

At the end of studying this course students will be able to

"**Apply tools and techniques of repairs and servicing in performing maintenance of a given vehicle considering efficiency, safety and environmental consideration.**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	125
3	-	2	5	80	20	00	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C**- Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Select the most appropriate tool for a given work
2. Use equipment tools, equipment, instrument and gauges as per standard practice
3. Perform preventive maintenance
4. Analyze a given preventive maintenance schedule
5. Prepare preventive maintenance schedule under given criteria and conditions
6. Diagnose fault based on a flow diagram/ chart

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Servicing & Repairs technology	1a. Differentiate between preventive and breakdown maintenance 1b. Identify type of a given entity in a service network	1.1 Motor Vehicle maintenance – types, salient features and applications 1.2 Servicing as a preventive maintenance- Generic actions in servicing, types- Clean, Inspect (check), Tighten, Set, Lubricate, replace and rotate 1.3 Repairs as a Break down maintenance- types, concept of overhauling, reconditioning, reclaiming etc 1.4 Evolution of modern garages – Black smith to service stations 1.5 Service network – hierarchy and roles and functions of each entity
Unit - II Selection of garage equipment, machines and tools	2a. Interpret a given specification of equipment 2b. Select equipment/ machine/ tool for a given service entity 2c. Maintain body temperature	2.1 Introduction of garage equipment, tools and machines- need, types, its application 2.2 General garage equipment – types, specifications, brief construction and working and use 2.3 Engine specific equipment - types, specifications, brief construction and working and use 2.4 Vehicle Body specific equipment - types, specifications, brief construction

		and working and use 2.5 Auto Electrical and electronics system specific equipment - types, specifications, brief construction and working and use
Unit - III Servicing Technology	3a. Prepare preventive maintenance schedule for a given vehicle as per criteria and conditions 3b. Analyse a given preventive maintenance schedule	3.1 Motor Vehicle servicing as a system- input – process – output, vehicle level and system level servicing 3.2 Types of servicing – Periodic-time – Hrs, days, months and KM based, condition monitoring based 3.3 Preventive maintenance schedule – need, structure, reading and comprehending the schedule and preparing it 3.4 Vehicle servicing techniques 3.5 Vehicle servicing strategies from different OEMs, service quality standards
Unit IV Repairs Technology	4a. Dismantling and assemble system and aggregates	4.1 Break down as a result of poor maintenance and negligence – Need, types – Mechanical and accident 4.2 Symptoms, faults and remedies of various vehicle systems 4.3 Body damage – repair or replace, denting and painting – equipment, tools and techniques 4.4 Repairs or replacement technology 4.5 Need of equipment in repairs
Unit - V Servicing of Motor vehicles and sub-systems	5a. Prepare plan for servicing a given vehicle	5.1 Motor vehicle servicing – Need, types – Free and paid, documentation etc 5.2 Vehicle servicing- Periodic maintenance schedule, actions involved, procedure, 5.3 Servicing of Engine 5.4 Servicing of vehicle transmission 5.5 Servicing vehicle systems 5.6 Servicing of vehicle chassis and body

		5.7 Servicing of Electrical and electronics systems
Unit – VI Reconditioning & Reclaiming technology	6a. Select the appropriate process for reconditioning of a given part 6b. Select the appropriate machine for reconditioning of a given part	6.1 Need and Requirements of reconditioning and reclaiming of systems and parts 6.2 Equipment and machines required – for Engine, chassis, systems related reconditioning and reclaiming 6.3 Machine construction, working and setting and Consumables required 6.4 Auto workshops – layout, organization structure 6.5 Reconditioning of parts, system and engine- procedure, benefits

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to Service and repair Technology	06	02	04	04	10
2	Requirement of Equipment, machines and tools	06	04	06	04	14
3	Vehicle service Technology	09	04	04	06	14
4	Vehicle repairs technology	09	04	04	06	14
5	Motor vehicle servicing	09	04	04	06	14
6	Reconditioning and reclaiming technology	09	04	06	04	14
Total		48	22	28	30	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Use of general tools	02
2	01	Use of special tools	02
3	03	Use of general equipment	02

4	04	Use of engine related equipment, tools and gauges	02
5		Use of Systems related equipment	02
6	04	Use of chassis and body related equipment	02
7	03	Demonstrate of Safety precautions to be observed in workshop	02
8	04	5 S demonstrations and practice	02
9	03	Vehicle servicing- 2Wheeler	02
10	03	Vehicle Servicing – 4Wheeler	02
11	05	Critical analysis of period maintenance schedule	02
12	05	Preparation of a schedule	02
13	05	Servicing of engine – clean, inspect, set, replace	02
14	05	Servicing of safety systems – clean, inspect, set, replace	02
15	04	Servicing of comfort systems – clean, inspect, set, replace	**02**
16	05	Servicing of electrical system – clean, inspect, set, replace	**02**
		Total	**32**

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Survey of automotive oils

b. Survey of repair cost of automotive aggregates

c. Survey of consumables used in service and repairs

d. Survey of tire care centre machinery

e. Survey of scan tools

f. Survey garage tools for specification and cost

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection

e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Automotive Mechanics	Crouse & Anglin	TMH Publication
2.	Automobile Engineering	Kirpal Singh	Dhanpat Rai Publication
3	Auto electrical and electronics systems	Tom Denton	Elesver
4	Workshop Manual	OEM	OEM – 2,4 wheeler, CV, SPV
5	Service manual	OEM	OEM – 2,4 wheeler, CV, SPV
6	Spare parts catalogue	OEM	OEM – 2,4 wheeler, CV, SPV
7	Steering and suspension - Shop Manual	Don Knowles	Cengage Learning
8	Auto engine – Shop manual	Don Knowles	Cengage Learning
9	Automotive Brake shop manual	Don Knowles	Cengage Learning
10	Automotive Transmission- shop manual	Don Knowles	Cengage Leanring

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	General Auto service station equipment viz. lifting, washing & cleaning, tightening, pressing, etc	As per Auto industry specification
2.	Engine service and repair related equipment – scan tool, removal and fitting of parts viz. piston ring, valve, damper pulley, gear, flywheel, liner etc	As per Auto industry specification
4	Body servicing and repair related equipment- denting , painting related	As per Auto industry specification

5	Vehicle system servicing and repair related equipment – namely for lighting, steering, brake, HVAC, suspension etc	As per Auto industry specification
6	Auto Electrical and electronics systems related equipment	As per Auto industry specification
7	Auto workshop	As per Auto industry specification

12. LEARNING WEBSITE & SOFTWARE

a. https://hercules.in
b. https://bsahercules.com/
c. www.herocycles.com
d. www.cosmobikeshow.com/en
e. http://www.allrefer.com/15-extremely-popular-bicycle-brands-world
f. http://www.letour.com/us/
g. www.shimano.com

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Use equipment tools, equipment, instrument and gauges as per standard practice	03			03	03						02	03
2	Perform preventive maintenance	03		03	03								03
3	Select tool for a given work	03			03	02							
4	Analyse a given preventive maintenance schedule		03	03				02					03
5	Prepare preventive maintenance schedule under given criteria and conditions		03							03			03

6	Diagnose fault based on a flow diagram/ chart			03						03			

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE COMPONENT DESIGN

COURSE CODE 6A411

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

This is one of the Advance Technology (AT) courses. The automobile engineering students should possess the knowledge of elementary basic design principles involved in design of machine parts and auto components. The course introduces simple design of machine elements like shafts, keys, joints, couplings, levers, springs, etc. The student will be supposed to maintain and sometimes modify the existing designs of machine parts and components. Fundamental knowledge of engineering mechanics, strength of materials, engineering materials and theory of machines is essential. Considering all these, this course is being introduced at this level.

2. COMPETENCY

At the end of studying this course students will be able to

"**Analyze the design aspects of any given automobile components and propose the design procedure of same**"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25@	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : L-Lecture**; T-**Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Analyze the various modes of failure of machine components under different load patterns.
2. Design a chassis component for given load condition.
3. Design the shaft and keys for given load condition.
4. Design the gear and gear shaft for given load and automotive application.
5. Formulate and propose procedure of design of automobile engine components.
6. Suggest ergonomics consideration while designing the various parts of automobile engine and chassis components.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Design	1a. Read Stress – strain diagram for ductile & brittle material. 1b. Describe a mode failure of automobile components. 1c. Identify the type of stresses induced in given components. 1d. Select a suitable material to sustain load condition	1.1 Machine Design philosophy and Procedures, General Considerations in Machine Design. 1.2 Fundamentals:- Types of loads, concepts of stress, Strain, Stress – Strain Diagram for Ductile and Brittle Materials, Types of Stresses such as Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion, Principle Stresses, Creep strain and Creep Curve (No Numerical**)** 1.3 Fatigue, S-N curve, Endurance Limit's) Factor of Safety and Factors governing selection of factor of Safety. 1.4 Stress Concentration – Causes & Remedies. 1.5 Converting actual load or torque into design load or torque using design factors like velocity factor, factor of safety & service factor's, Properties of Engineering

		materials, Designation of materials as per IS ,introduction to International standards & advantages of standardization, use of design data book, use of standards in design and preferred numbers series. 1.6 Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory.
Unit - II Design of Chassis Component	2a. Write and follow Standard design procedure for different types of chassis components. 2b. Select appropriate material for different simple chassis components. 2c. Interpret the design consideration while designing chassis components.	2.1 Clutch: introduction, material, design consideration, uniform pressure and wear theory, design of single plate, multi plate and centrifugal clutch 2.2 Brakes: introduction, material of brake lining, types, energy absorbed by a brake, heat to be dissipated during braking, design consideration and design of internal expanding type of brake. 2.3 Levers: introduction, types of levers, material, design of foot levers only. 2.4 Springs: application of springs, classification of spring (including air spring used in automotive), material, manufacturing and terminology used for helical and leaf spring, concept of buckling, surging , jack nipping of spring, design of helical and leaf spring. (Note: Use of Design Data book allow in ESE)
Unit - III Design of Shafts and Keys	3a. Write and follow Standard design procedure for design of shafts. 3b. Able to select appropriate material for shaft and keys	3.1 Types of Shafts, materials, Design of Shafts (Hollow and Solid) using strength and rigidity criteria and ASME code of design, shafts supported between bearings with

	as per application. 3c. Interpret the design consideration while designing shaft.	one or two pulleys in between or one overhung pulley. Design and design consideration of propeller shaft of automobile. 3.2 Types of keys function of keys, Design of Sunk Keys, Effect of Keyways on strength of shaft. (Note: Use of Design Data book allow in ESE)
Unit - IV Design of Gears	4a. Write and follow Standard design procedure for design of gears. 4b. Able to select appropriate pitch and different design properties by using IS chart. 4c. Interpret the design consideration while designing gears.	4.1 Spur gear- design considerations beam Strength of gear tooth-lewis equation, permissible working stress for gear tooth in lewis equation, dynamic tooth load, static tooth load, wear tooth load, design of spur gear and spur gear shaft. 4.2 Helical gear- terms used in helical gears, face width of helical gears, formative or equivalent, number of teeth for helical gears, strength of helical gears, design of gear and shaft for helical gear. 4.3 Bevel gear- terms used in bevel gears, determination of pitch angle for bevel gears, proportions for bevel gears, formative or equivalent number of teeth for bevel gears—tredgold's approximation, strength of bevel gears, forces acting on a bevel gear, design of bevel gear and a shaft for bevel gears. 4.4 Worm gear- types of worm gears, terms used in worm gearing, proportions for worm gears, efficiency of worm gearing, strength of worm gear teeth, wear tooth load for worm gear, forces acting on worm gears, design of worm gearing.

		(Note: Use of Design Data book allow in ESE)
Unit – V Design of Engine Components	5a. Write and follow Standard design procedure of engine component. 5b. Interpret the design consideration while designing engine component. 5c. Select appropriate bearing for different engine application by using manufacturer's catalogue.	5.1 Engine power requirements, Selection of engine type, Stroke & Bore, compression ratio, clearance volume and swept volume, mean piston speeds. 5.2 Design of Piston, Piston pin& Piston rings: terminology of piston, piston slap and design consideration, Materials, design of piston, pin and piston rings. 5.3 Design of Crank shaft & Connecting Rod: Forces, material, types, design consideration, design of split type connecting rod and design of overhang type crankshaft 5.4 Cam shaft and Valve operating mechanism Design: Types of cam profile, material, Design of cam profile, design consideration of rocker arm and valve, material and design. 5.5 Flywheel: material, design consideration, types, design calculation. 5.6 Bearings: Sliding contact & rolling contact, terminology of Ball bearings, life load relationship, basic static load rating and basic dynamic load rating, limiting speed. Selection of ball bearings using manufacturer's catalogue. (Note: Use of Design Data book allow in ESE)
Unit – VI Ergonomics & Aesthetic consideration in	6a. Identify a different ergonomics and Aesthetic consideration used in given automotive components.	6.1 Ergonomics of Design – Man – Machine relationship. Design of Equipment for control, environment & safety.

design		6.2 Aesthetic considerations regarding shape, size, color & surface finish.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to Design	06	02	06	04	12
2	Design of Chassis Component	12	04	08	04	16
3	Design of Shafts and Keys	08	04	04	06	14
4	Design of Gears	08	04	04	06	14
5	Design of Engine Components.	12	04	06	06	16
6	Ergonomics & Aesthetic consideration in design	02	00	02	06	08
	Total	48	18	30	32	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Identify & classify the different engine & chassis components according to the type of load to which they are subjected. Also state the types of induced stresses in them.	2
2	01	Identify the different engine & chassis components which may fail due to stress Concentration, observe & state remedy to reduce stress concentration.	2
3	01	Identify and suggest new material for different engine and chassis components by justifying the need of design properties.	2
4	02	Design and Draw a Sheet on clutch.	2
5	02	Design and Draw a Sheet on Lever	2
6	02	Design and Draw a Sheet on Spring (helical and leaf).	2
7	03	Design and Draw a sheet on propeller shaft / transmission shaft.	2
8	03	Design and Draw a sheet on spur/helical/bevel/worm gear.	2
9	04	Identify different fasteners used in an automobile and justify their locations.	2
10	05	Design and Draw a piston, piston rings and piston pin for	4

		petrol/diesel engine.	
11	05	Design and Draw a connecting rod.	2
12	05	Design and Draw a crank shaft.	2
13	05	Design and Draw a cam shaft and valve operating mechanism.	2
14	05	Survey of different standard bearings available in the market along with specifications.	2
15	06	Identify any three components of engine or chassis which needs more design enhancement in the scope of ergonomics and suggest further development.	2
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey for various type of engine and chassis components makes.

b. Mini project on field survey (prepare design failure survey of any machine and recommend the alteration in existing design)

c. Prepare 2 models of any components designed in practical session in commercial modeling software like POR-E/ CATIA/UG-NX/CREO.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-
b. Q & A technique.
c. Demonstration
d. Dissection
e. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Machine Design	R. K. Jain	Dhanpat Rai & Sons
2.	Text Book of Machine Design	R. S. Khurmi & J. K. Gupta	Khanna

3	Machine Design	Pandxa & Shah	Charator
4	Design data Book	P S G Coimbatore	PSG
5	Problems in Auto Engineering	N. K Giri.	Khanna
6	High Speed Diesel Engines	Peter Martine Heldt	P. M. Heldt, 1943
7	Automotive design	Colchin and Demidov	Mir, 1984

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Different types of Bearing.	As per Automotive industry specification
2.	Different types of Fasteners, screw, nut, keys, shafts, bolt and stud.	As per Automotive industry specification
3.	Different types of Gears	As per Automotive industry specification
4.	Leaf spring and Helical Spring	As per Automotive industry specification
5.	Different types of actual model of engine component like piston, crank shaft and piston pins, connecting rod etc.	As per Automotive industry specification

12. LEARNING WEBSITE & SOFTWARE

a. www.engineersedge.com
b. www.howstuffworks.com
c. http://onlinecourses.nptel.ac.in

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02

1	Analyze the various modes of failure of machine components under different load patterns.	-	2	3	-	3	2	-	-	-	-	3	-
2	Design a chassis component for given load condition.	-	3	3	2	3	-	-	-	-	-	3	-
3	Design the shaft and keys for given load condition.	-	3	2	2	3	-	-	-	-	-	3	-
4	Design the gear and gear shaft for given load and automotive application.	-	3	3	2	3	-	-	-	-	-	3	-
5	Formulate and propose procedure of design of automobile engine components.	-	3	3	2	3	2	-	-	-	-	3	-
6	Suggest ergonomics consideration while designing the various parts of automobile engine and chassis components.	-	3	3	2	-	-	-	-	-	1	3	1

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- AUTOMOBILE COMPUTER AIDED DESIGN

COURSE CODE 6A410

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

Automobile computer aided design represents a class of engineering field. An Automobile computer aided design requires knowledge of new high end design software's and tools. In this course students will work with CAE (Pro-e / CREO 2.0 / Solid work / Catia etc.) software. This course imparts new skills and knowledge to the budding automobile diploma students. It will give new dimension to their understanding and practicing engineering at their level. This technology course category introduces AET (automobile Engineering technician) to CAE software, its 2D and 3D modeling environment and design of auto component parts. It further introduces them to certain fundamental CAD based software's on which s/he can observe, create, simulate and interact with various designs associated with every automobile vehicle as well as automobile component.

2. COMPETENCY

At the end of studying this course students will be able to

"Design automobile components using CAE software"

"Identify automobile parts and design in accordance with it as retrofit & suggest the repair technique"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (PR)	PA (TW)	50
0	-	4	4	--	--	25@	25	
Duration of the Examination (Hrs)				--	--	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Perform different CAE software (sketching, modeling and analysis) and file related operations.
2. Use various 2D sketching tools effectively.
3. Use various solid modeling tools effectively.
4. Use various surface and sheet metal modeling tools effectively.
5. Use various assembly and analysis tools effectively.
6. Perform sketching, modeling and analysis of any given automotive composite system.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to CAD software	1a. Identify CAE environment and user interface, toolbars etc. 1b. Identify and change the hardware configuration as per requirement. 1c. Perform the installation of given CAD software.	1.1 Introduction 1.2 Necessity of CAE (Computer-Aided-Engineering), tools of CAE (modeling, processing and post processing) and role of CAE in product life cycle 1.3 User Interface Overview (view port controls, ribbon, view cube, project navigator, tool palettes, status bar, command window, properties palette, view cube, file tabs, viewport controls, application menu, quick access toolbar etc. 1.4 File operations and file formats 1.5 CAD tool Installation procedure and hardware Configuration
Unit - II 2D Sketching	2a. Identify different tools of 2D sketching mode of any given CAD software. 2b. Construct a given 2D sketch with minimum possible steps.	2.1 Introduction 2.2 Necessity of 2D Sketching and sketch mode (overview of 2D user interface) 2.3 Sketch operations- fillets, splines, polygon, circle, lines, deleting,

	2c. Perform a dimensioning for given 2D sketch.	mirroring, trimming, extending, pattern, scaling, rotating, text in sketch, importing sketches etc. 2.4 Dimensioning- dimensioning a sketch, modifying a dimensions and working with constrained.
Unit - III Solid modeling	3a. Identify different tools of 3D modeling mode of any given CAD software. 3b. Construct a given 3D model with minimum possible steps. 3c. Create and select appropriate datum features as per requirement.	3.1 Introduction 3.2 Necessity of 3D modeling and 3D mode (overview of 3D user interface) 3.3 Datum- default datum planes, datum plane and axis, datum points and creating datum on-the-fly 3.4 Modeling operations- extrude, revolve, hole, round, chamfer, ribs, shell, variable section sweep, swept blend, helical sweep, blend section to surface , blend between surfaces, warp, pattern, mirroring geometry, copying features, model section etc.
Unit - IV Surface and Sheet metal Modeling	4a. Identify different tools of surface and sheet metal modeling mode of any given CAD software. 4b. Construct a given sheet metal model with minimum possible steps.	4.1 Introduction 4.2 Necessity of surface modeling and overview of user interface. 4.3 Surface and sheet metal Modeling operations- boundary blends, mirror and merge, trim and fill, intersect and offset, thicken and solidify, walls, adding relief, conversion, cuts, flat pattern, style features etc.
Unit – V Assemblies and Analysis	5a. Identify different tools of assemblies and analysis operation of any given CAD software. 5b. Use appropriate constrain for assembly operation. 5c. Use appropriate boundary condition for analysis of given model.	5.1 Introduction to part assembly and analysis. 5.2 Necessity of part assembly and overview of user interface. 5.3 Assembly operations- calling components, constraining components, assembly analysis, working with layers and visibility, patterning, exploded views, top-

		down and bottom-up design approach etc. 5.4 Introduction to part / assembly analysis. 5.5 Basic of FEA- P-elements vs H-elements, constrained, load, material selection or material properties, static and dynamic analysis, report preparation of analysis etc.
Unit – VI Mini project on composite system	6a. Plan the steps for sketching, modeling and analysis of a given composite engine system. 6b. Use plan tools effectively. 6c. Prepare a analysis report for given composite engine system.	6.1 Automobile Engine- head, block, cylinder, piston, connecting rod, crank shaft, cam shaft, timing chain, timing gear, flywheel, engine assembly. 6.2 Automobile Chassis and Body- axle, wheels, differential, propeller shaft, bumper, mud guard etc. 6.3 Automobile transmission- helical gears, bevel gear, spur gar and gear box assembly. 6.4 Automobile system- modeling of coupling, modeling of C.V. joint and universal joint, modeling of clutch and brake system and assembly etc.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to CAD software	08	--	--	--	--
2	2D Sketching	08	--	--	--	--
3	Solid modeling	08	--	--	--	--
4	Surface and Sheet metal Modeling	12	--	--	--	--
5	Assemblies and Analysis	14	--	--	--	--

6	Mini project on composite system	14	--	--	--	--

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	Demonstration of user interface of CAD software (Pro-E, Catia, Creo, Solid work etc.)	04
2	01	Checking of hardware configuration and installation of CAD software with appropriate setting.	04
3	02	Hands on practice of 2D sketching mode of CAD software.	04
4	03	Hands on practice of solid modeling mode of CAD software.	08
5	04	Hands on practice of surface / sheet metal modeling mode of CAD software.	04
6	05	Hands on practice of assembly mode of CAD software.	04
7	05	Hands on practice of analysis mode of CAD software.	04
8	06	Project related to Automobile engine	08
9	06	Project related to Automobile Chassis and Body	08
10	06	Project related to Automobile Transmission	08
11	06	Project related to Automobile System	08
		Total practical hours	64

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Organizing Modeling competition

b. Activity to design any automobile component assembly: - Design 4 wheeler known model like TATA, Mahindra etc. car by proper dimensions mentioned with the model. Create assembly, exploded view and detailed drawing sheet.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-

b. Q & A technique.

c. Demonstration
d. Activity based learning

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Auto CAD manual	Sunil Pande	S.K. Kataria & sons
2.	AUTO CAD-2010 in simple step	Kogent	Dream Tech.
3	Pro-E manual	Gary Lamit	C.L. Engineering
4	Pro-E manual	Shum Tikku	Dream Tech.

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Personal Computer systems	Windows 64 bit, 10/8/13 graphics driver
2.	Updated licensed version of any CAD software.	Pro-E, Catie, Solid work, Creo etc.
4	Manuals of software	----------
5	Plotter	Standard available in the market

12. LEARNING WEBSITE & SOFTWARE

a. http://www.study.com/free_online_corurses_and_ education
b. http://www.educad.co.za/e-learning
c. http://www.ptc.com/en/academic-program/products/ptc-university-elearning

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02

1	Perform different CAE software (sketching, modeling and analysis) and file related operations.	--	--	--	3	--	--	--	--	--	--	2	--
2	Use various 2D sketching tools effectively.	--	3	--	3	--	--	--	--	--	--	3	--
3	Use various solid modeling tools effectively.	--	3	--	3	--	--	--	--	--	--	3	--
4	Use various surface and sheet metal modeling tools effectively.	--	3	--	3	--	--	--	--	--	--	3	--
5	Use various assembly and analysis tools effectively.	--	3	--	3	--	--	--	--	--	--	3	--
6	Perform sketching, modeling and analysis of any given automotive composite system.	--	3	2	3	--	--	1	--	--	--	3	--

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)

Coordinator -Programme Curriculum

Chairman - Programme Board Of Studies(PBOS)

COURSE TITLE- ADVANCED AUTOMOBILE ENGINE TECHNOLOGY

COURSE CODE 6A404

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Automobile	Sixth

1. RATIONALE

This applied technology level course enables students to understand various advances in engine technologies. The world is leading towards two crises viz. energy and destabilization of earth ecosystem as a result of fast depletion in crude oil reserves and huge vehicular pollution in the era of fast motorization. Every country and OEMs have been working to face this challenge through conservation of and substitution to conventional fuels and reduction pollution leading to Zero emission vehicle (ZEV). This has initiated extensive developments in automotive engines and their systems. Hence this course is introduced.

2. COMPETENCY

At the end of studying this course students will be able to

"Analyse advance automotive engines and its sub systems"

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (OR)	PA (TW)	150
3	-	2	5	80	20	25#	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture**; T**-Tutorial/Teacher Guided Theory Practice **; P-** Practical**; C-** Credits**; ESE-** End Semester Examination**; PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal, ~ Online Examination

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify the advancement in the given engine of Automotive.
2. Measure / calculate parameters based on standards of a given engine.
3. Justify the need of respective advancement made in given SI engine
4. Justify the need of respective advancement made in given SI engine
5. Compare Performance characteristic of Heat Engine powered vehicle and Hybrid vehicle.
6. Justify the need of Non-conventional IC Engine.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Introduction to Advanced Auto Engines	1a. Interpret given performance parameters of an engine 1b. Calculate engine requirement	1.1 Requirement of advances in auto engines- crises- energy, destabilization of earth ecosystem, Motorization and it is effect of consumption of crude oil and vehicle pollution, data to quoted 1.2 Strategies for energy crises – conservation of, substitution to conventional fuels and development engine technologies 1.3 Destabilization of the earth ecosystem – reasons and actions – Early & after exhaust treatment technologies, hydride prime mover and electrical vehicle 1.4 Systemic development in automotive engine – use of electronics, instrumentation, control, information technologies in replacing mechanical functions 1.5 Targets for automotive engine development – low NVH and specific weight, volume and fuel consumption and high specific power, Energy consumption standards for motor vehicles, diagnosis- discussion using

		different engine characteristics
Unit - II Automotive Engine related standards and norms	2a. Measure various emissions of a given engine 2b. Calculate requirement energy consumption as per a prevailing standards	2.1 Introduction to standards and norms- need, types and its advantages 2.2 Environmental norms – International Evolution, types EPA, Euro, Bharat, effect of norms on engine and fuel technology and their effect on auto engine 2.3 NVH norms- need, measurement techniques, international and national norms 2.4 Energy conservation norms for motor vehicle- need, evolution, calculation. 2.5 Auto industry norms for specific power, weight, SFC, On board diagnosis of engine.
Unit – III Advances in Petrol Engine	3a. Identify technology in a given advanced petrol engine 3b. Distinguish between two advance technology 3c. Select a technology for a given application	3.1 Introduction to advanced petrol engines – draw backs of conventional petrol engines – limitations of carburetor conventional ignition systems and its effects on efficiency, smoothness, acceleration and emission 3.2 Fuel Injection System- Evolution – L, K, KE, D Jetronic (CFI, TBI, MPFI), types, block diagram, working, advantages and disadvantages of each 3.3 Ignition systems – Evolution – Electronic-programmes-DLI-DI, types, block diagram and working of each, advantages and disadvantages of each over other 3.4 Motronics system – need, types, block diagram, construction and working, advantages 3.5 Parts of advance injection and ignition systems – sensors –

		IAT,MAF, TPS, MAP, O2, knock, CKP, CMP, Electronics control unit as a controller and actuator like injector, purge valve, ignition trigger, Idle speed control, fuel pump relay,
Unit – IV Advances in Diesel Engines	4.1 Identify technology in a given advanced diesel engine 3a. Distinguish between two advance technologies of the engine 3b. Select a technology for a given application/ a given situation	4.1 Introduction to advanced diesel engines – draw backs of conventional diesel engines – limitations of fuel supply and injection system and its effects on efficiency, NVH, smoothness, acceleration, start ability, and emission 4.2 Correction in conventional Injection systems- compensators for absolute manifold pressure, altitude pressure, temperature, electric shut off- construction, working and effects 4.3 Early electronic diesel control systems – PE EDC and EDC systems, construction, working, advantages and disadvantages 4.4 Common Rail system (CRS) – need, Block diagram, construction, working and advantages 4.5 Cold start system- need, types- manual and automatic, glow plug control system in modern engine- construction and working 4.6 Unit Injection and unit pump systems – construction and working, advantages and disadvantages
Unit – V Hybrid power train	5a. Identify the hybrid technology in a given vehicle 5b. Differentiate between two hybrid technologies 5c. Select hybrid technology in	5.1 Introduction to hydrid power train- need, types, relative merits of each 5.2 Primary prime mover – types and its performance characteristics 5.3 Serial hybrid power train- block diagram, construction, working,

	a given situation	advantage and disadvantage 5.4 Combined hybrid power train- block diagram, construction, working, advantage and disadvantage 5.5 Parallel hybrid power train- block diagram, construction, working, advantage and disadvantage 5.6 Plug in hybrid – need, block diagram, construction, working, advantage and disadvantage 5.7 Electric prime movers – introduction
Unit – VI Nonconventional Engines	6a. Identify advanced technology of given non conventional engines 6b. Differentiate between them 6c. Select a technology for given situation	6.1 Introduction non conventional prime movers – need, types, advantages and disadvantages 6.2 Duel Fuel/ multi – fuel engine: working principle, nature of knock in dual-fuel engines, factor affecting combustion in a dual-fuel engine, advantage of dual fuel engine. 6.3 Lean Burn Engine- basic technology, lean burn combustion, combustion monitoring, lean burn emissions, Toyota lean burn engine, Honda lean burn system, Mitsubishi ultra lean burn combustion engines. 6.4 Stratified Charge Engine – need**,** working principle, stratification by fuel injection and positive ignition, Volkswagen PCI stratified charge engine, broderson method of stratification, charge stratification by swirl (ford FCP, ford PROCO, TCP and Witzky). 6.5 Other Advancements need, types- Variable valve timing, variable manifold, variable compression, turbo/super charging, EGR.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Introduction to advanced auto engines	06	00	06	04	10
2	Automotive engine related norms and standards	06	03	08	04	15
3	Advances in petrol engines	10	03	08	04	15
4	Advances in Diesel engines	10	03	08	04	15
5	Hybrid Power train	08	03	08	04	15
6	Nonconventional Engines	08	04	06	00	10
	Total	48	16	44	20	80

Legends: R – Remember, U – Understand, A – Apply (As per Bloom's revised Taxonomy)

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	02	Demonstrations of advance exhaust system of two wheeler and four wheeler check the components and draw the circuits	02
2	02	Perform exhaust gas analysis of an engine using 4-gas analyzer. (diagnose engine condition from exhaust gas analysis)	02
3	03	Demonstrations on MPFI demonstration kit, identify the components, draw the circuit of electrical and fuel supply line.	02
4	03	Remove the FI system of two wheeler identify and check the components, draw the circuits and refit.	02
5	03	Testing of injector of SI engine on FI test bench and prepare a report of test.	02
6	03	Remove the cylinder heads and block from the engine of motor cycle, identify and check the location of valve, valve timing components etc.(Make comparative report on difference in arrangement of engine components between at least two engines from two different manufactures).	02
7	03	Dismantle and assemble four stroke engine of two/four wheelers and set the correct valve timing. (Make comparative report on difficulty while assembling and time setting of at least two engines from different manufacture).	02

8	04	Demonstrations of CRDi system of diesel engine identify, locate the components and draw the circuits.	02
9	04	Demonstrations of Electronically controlled diesel Injection pump, identify and locate the components.	02
10	04	Perform calibration of diesel pump on test bench and prepare report of calibration.	02
11	04	Perform injector testing of CI engine on FI test bench and prepare report of testing.	02
12	05	Demonstration of a drive-train of hybrid vehicle.	02
13	06	Dismantle and assemble the EGR valve from the engine, identify and check the components, draw the circuits and refit.	02
14	06	Demonstration and performance analysis of VCR and Dual fuel engine.	04
15	06	Demonstration and analysis of any new advancement in IC engine viz. VVT, I-VTEC, I-DTEC, DDIS, DTS-I, TDI etc.	02
		Total practical hours	32

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular student's activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Internet Survey about advance petrol engines

b. Internet Survey about advance diesel engines

c. Internet Survey about hybrid vehicle and their prime movers

d. Market survey of turbo chargers

e. Market survey of Injectors, sensors, for petrol engines

f. Market survey of smoke meters and gas analysers

g. Market survey of Injectors, sensors, for diesel engines

h. Technical survey of combustion chambers, induction and exhaust systems of any four vehicles present in market

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods-

b. Q & A technique.
c. Demonstration
d. Dissection
e. Testing

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	A course in internal combustion engine	M.L Mathur, R.P.Sharma	Dhanpat Rai Publication
2.	A course in internal combustion engine	V. Ganeshan	Tata McGraw Hill
3	Internal Combustion Engine Fundamentals	John Heywood	Tata McGraw Hill (Indian Edition)
4	Engine Emissions: Pollutant Formation and Advances in Control Technology	B.P. Pundir	Narosa (2007)
5	Advanced Engine Technology	Heinz Heisler	E. Arnold, 1995
6	Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Husain	CRC Press, 2010
7	Gasoline engine Management	Bosch	Bosch
8	Diesel Engine Management	Bosch	Bosch

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	4-Way Exhaust gas analyzer.	As per industry specification
2.	MPFI demonstration bench.	As per industry specification
4	CDRI Demonstration bench	As per industry specification
5	Vehicles with advanced engine	As per manufacture specification
6	Aggregates of advanced engines – EGR, Turbo charger, Canister, throttle body	As per industry specification

	with ISCS, Injectors, sensors, Pumps for diesel and petrol engine.	
7	Engine Scan tool	For Diagnosing Petrol Injection Systems (MPFi), Electronic Diesel Control Systems (EDC), Anti-lock Braking Systems (ABS), Air Bags, etc. 2 channel oscilloscope for determining measurement values, use of Oscilloscope parallel to trouble shooting, Measuring accuracy 1% from the mean value, Available resistance measurement, Measuring range 100 ohm to 1M ohms. Software with OBD hardware, Laptop of higher end & compatibility with the Hardware of Diagnostic Tester & bluetooth enability. Clear communication is enabled through multiplexer and cable adapter recognition: K- and L-line, SAE and CAN. It can be connected to all current laptops/ computers via the USB interface. Application Software +features - 3 year validity, Application Software Diagnosis/service info system - 3 year validity.

12. LEARNING WEBSITE & SOFTWARE

a. http://www.howstuffworks.com
b. http://www.webelements.com
c. http://onlinecourses.nptel.ac.in
d. http://training.sae.org/seminars/c0103/
e. http://englearn.osu.edu

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

Sr. No.	Course Outcome	PO										PSO	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify the advance engine in a given vehicle	-	3	-	2	2	-	-	-	-	-	-	3
2	Measure/ calculate standard parameters of a given engine	-	3	-		3	3	-	-	-	-	-	2
3	Analyse a given advanced petrol Engine	-	3	1	2	3	1	-	-	-	-	-	3
4	Analyse a given advanced diesel Engine	-	3	1	2	3	1	-	-	-	-	-	3
5	Analyse the hybrid prime mover of a given vehicle	-	3	1	2	2	3	-	-	-	-	-	3
6	Analyse the advanced technology of given engine	-	3	-	3	3	2	-	-	-	-	-	3

14. COURSE CURRICULUM DESIGN COMMITTEE

Sr No	Name of the faculty members	Designation and Institute
1	Ganesh Dalvi	Head of the Department, Govt. Polytechnic, Aurangabad
2	Samir Telang	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad
3	Dattatry Giripunje	Lecturer in Automobile Engineering, Govt. Polytechnic, Aurangabad

15. AUTHENTICATION (To be signed by Authorized signatories)

Member Secretary -Programme Board Of Studies (PBOS)	Coordinator -Programme Curriculum	Chairman - Programme Board Of Studies(PBOS)