GOVERNMENT POLYTECHNIC, AURANGABAD

[AN AUTONOMOUS INSTITUTE OF GOVERNMENT OF MAHARASHTRA]

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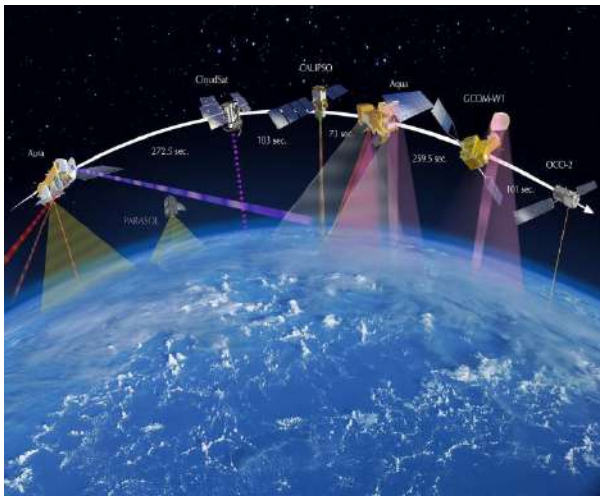
SIXTH REVISION CURRICULUM DOCUMENT 2017-2018



DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

GOVERNMENT POLYTECHNIC, AURANGABAD

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

PREFACE:

Government Polytechnic, Aurangabad, the oldest institute in Maharashtra was established in the year 1995-96. 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 programs to 720 Intake in eight programs. 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 Programs in I Shift (Regular), II shift and Part Time Diploma programs 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 Program 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 program offering Departments, and with program Educational Objectives (PEOs) , program 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 program have been introduced as compulsory. To accommodate these additional courses and other requirements, the credits of each program have been enhanced from 184 to 194.

'Skill India', 'Digital India 'and 'Make in India' the flagship programs/ 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 as highly relevant ,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 program will be implemented in true spirit to achieve the intended educational objectives of the program.

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

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Semester wise course structure of new curriculum: 6th Revision 10th Pass

Year 1		Year 2		Year 3	
Semester1	Semester2	Semester3	Semester4	Semester5	Semester6
Basic Maths 6G101 (3+1)	Engineering Maths 6G102 (3+1)	EDC –I 6X204 (4+2)	Electronic Workshop 6X207 (0+4)	Microwave & Satellite communication 6X411 (3+2)	IM 6G305 (3+2)
Engineering Physics 6G103 (3+2)	Engineering Chemistry 6G104 (3+2)	DE 6X205 (4+2)	EDP 6G306 (2+2)	Control Systems & PLC 6X404 (3+2)	Maintenance of Electronic Equipments 6X409 (0+4)
Engineering Graphics 6G201 (2+2)	Workshop Practice 6G202 (0+3)	CKN 6X206 (4+2)	LIC 6X402 (3+4)	ECD 6X401 (3+2)	MFO 6X505 (4+2)
Basics of Computer Systems 6G203 (0+2)	Electrical Technology 6X202 (4+2)	PP 6X208 (0+2)	EDC-II 6X405 (3+4)	Digital Communication 6X407 (3+2)	Software Lab MATLAB 6X413 (1+4)
Introduction to Instruments 6X201 (0+2)	Programming Language 6X203 (2+4)	EMI 6X209 (3+2)	Microcontroller 6X408 (3+2)	CHN 6X412 (2+2)	Power Electronics (4+2) 6X406
English 6G301 (2+2)	Communication Skills 6G302 (1+2)	Electronics Communica-tion - I 6X403 (4+2)	Electronics Communication - II 6X410 (3+2)	Project-I Seminar (0+2) 6X501	Project-II (0+4) 6X502
Development of Life Skills 6G303 (0+2)	Environmental Science 6G304 (0+2)	_____	Elective –I [6X414 – 6X417] (3+2)	Elective –II [6X506– 6X509] (3+2)	Elective –III [6X510 – 6X513] (3+2)
_____	NEC (0+2)	NEC (0+2)	←In-plant training [6X503]	Report submission → (0+4)	
23 [10+1+12]	31 [13+1+17]	33 [19+14]	37[17+0+20]	35[17+18]	35[15+20]
23	54	87	124	159	194

ELECTIVE II : [A] 6X506 AE-II [B] 6X507 A.C –II [C] 6X508 AMC [D] 6X509 I.C.C II

ELECTIVE III : [A] 6X510 RQ.M [B] 6X511 EPD [C] 6X512 ESS] [D]6X513 DSD USING VHDL

Institute Vision

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

Institute Mission

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

Department Vision

"To be a centre of excellence, assuring competitive technical manpower for emerging trends in the field of electronics & telecommunication *to address multidisciplinary sectors.* "

Department Mission

M1: Strengthen the knowledge & skills to convert concept, idea into system for employability/ entrepreneurship.

M2: Develop software skills needed in the field of electronics.

M3: Expose the students to industrial

M4: Build personality, teamwork spirit, professional ethics & social concern.

Program Educational Objectives (PEOs)

PEO1: Inculcate profound knowledge of electronics & telecommunication

PEO2: Evolve software skills needed in the field of electronics.

PEO3: Provide nourishing environment for new concepts & ideas for problem solving and/or develop new system leads to entrepreneurship/employability.

PEO4: Build virtuous, gregarious, social concerned personality.

Program Objectives

PO1. **Basic knowledge:** Apply knowledge of basic mathematics, science and engineering to solve the problems related with electronics, maintenance of equipments & troubleshooting.

PO2. **Discipline knowledge:** Apply discipline - specific knowledge to solve core and/or applied problems.

PO3. **Experiments and practice:** Plan to perform experiments and practices and to use the results to solve problems.

PO4. **Engineering tools:** Apply appropriate technologies and tools with an understanding of the limitations

PO5. **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in field of Electronics Telecommunication Engineering.

PO6. **Environment and sustainability:** Apply engineering solutions for sustainable development practices in societal and environmental contexts.

PO7. **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in field of Electronics Telecommunication Engineering.

PO8. **Individual and team work:** Function effectively as a leader and team member in diverse/ multidisciplinary teams.

PO9. **Communication:** Communicate effectively in oral and written form.

PO10. **Life-long learning:** Engage in independent and life-long learning in the context of technological changes.

PSO1. **Modern Software Usage:** Use latest PCB making, programming, simulation, MATLAB, software for layout design, artwork, microcontroller programming.

PSO2. **Scrutinize & control Electronics systems:** Scrutinize right type of machinery, equipments, tools, models and software for implementation & control of particular Electronics & Telecommunication systems.

SCOPE OF DIPLOMA IN ELECTRONICS & TELECOMMUNICATION EDUCATIONAL SCOPE / INDUSTRIAL SCOPE

Taking educational scope and industrial scope of our diploma in Electronics and Telecommunication into consideration, today's time is coming up with new technological advancements every day. These new developments are done by the engineers. In bringing their own thoughts in next brilliant technological advancement and this path can be achieved by producing quality outcome based Electronics &Telecommunication Diploma Engineers. In-depth knowledge at diploma level is required for such tasks and this further divides Electronics & Communication into various sub fields. This field has a great scope inMarathwada , Maharashtra , India & other countries.

CAREER PROSPECTS

Our outcome based curriculum gives profile to career prospects, there is huge demand for competent engineers in electronic industry to cope this demand in technology. These diploma engineers would be involved in sustaining cutting edge technology to stay ahead in competition and to work as technician.

- Our E&TC engineer can find a job in Consumer electronics manufacturing organization, Telecommunication & IT industries, Health care equipment manufacturing, Mobile communication(2G,3G,4G), Internet technologies, Power Electronics, and other industries like steel, petroleum and chemical industry, directing control and testing production process.
- They can specialize in technical sales, product representation, systems management, the design and manufacture of electronic devices and systems, or the installation, maintenance and repair of electronic systems and equipment.
- They may also work with computers and electronic equipment in the medical, manufacturing, industrial control, telecommunications, aeronautical and military fields.

  ECE also have several job openings & good pay-packages as compared to other branches.
- Electronics and Communication Engineers are acquired by top recruiters (both private and government) like DMRC, Siemens, Motorola, Intel, Texas Instruments, BEL, ISRO, DRDO, Accenture, Wipro, HCL Technologies, NVidia, Samsung, Tech Mahindra, Infosys, TCS, Conexant, MTNL, AIR, BSNL, Indian Air force, Indian Navy, Railways, Bharat Electronics Ltd and Flextronics and Philips Electronics.

All these developments have been fueled by advances in communications technology. new protocols and coding schemes, new ways to represent video, images and speech as data, new means of delivering this information to users via cable, fiber, and increasingly via radio are constantly being emerged. These developments are, in turn, based on sound engineering principles.

PROFESSIONAL PROSPECTS

Our Diploma offers soft professional practice which gives student confident to work at any level of management. Students also develop computing and software skills in basic computer system, C language and Visual Basic .

Areas of Employment/ work

Sr. No.	Type of Industries / Organization	Designation
01	Entrepreneur	Owner of Small Scale Industry
02	Catering services to society (Networking)	Telecommunication Engineer
03	Electronics Goods Manufacturing industry	Supervisors (Middle level) / Marketing Executive
04	Job in Industry / Public sector	Design Assistant / Customer Service Engineer
05	Repairing & maintenance of Electronic equipments and appliances	Maintenance Engineer

Identified Job Functions-

Sr. No.	Designation	Job Functions
01	Entrepreneur	*Project Management *Estimate, Procure &install necessary machinery. *Monitoring of all activities *Administer & Manage an industry *Marketing. *Keep control over production quality.
02	Supervisor	* Knowledge about activity of industry. * Co-ordination of staff. * Implementation of Production Planning and control in Co-ordination with other dept. * Plan, monitor and effectively Implement activities as per Policy. * Safety of men & machines.

		* Quality Policy. * Get the job done from workers. * Follow daily schedule. * Keep a watch on quality
03	Telecom Engineer	Installation, Commissioning of Network Organization of network services
04	Design Assistant	Preparation of artwork and PCB, Soldering, testing of prototype
05	Maintenance Engineer	After sales support, Repairing of various equipments, fault finding and troubleshooting
06	Embedded System Design Engineer	* Design small application circuits based on microprocessor, microcontroller *Implement as an embedded system

Program Aims

- To provide a practice oriented education, emphasizing execution of design plan and in-depth knowledge of the competencies required for the profession.
- To develop competencies mentioned in the Curriculum.
- To develop practical approach of student in technical subjects and provide hands on experience as much as possible.
- To develop professional skills as well as personality traits of the student along with Technical knowledge

Identified Competenciesrequired

Sr. No.	Competencies
1	To be aware of basic of Measurements of electronic parameters & Measuring Instruments.
2	To be aware of basic of Measurements of electronic parameters & Measuring Instruments
3	To know, construct, design and test the analog circuits
4	To know, construct, design and test the digital circuits
5	To develop software skills so as to develop logical approach in design and development of electronic /telecom systems

6	To handle laboratory equipments
7	To develop fault finding ability
8	To develop demonstrational methodology & presentation skills
9	To understand microprocessors/microcontrollers and to develop applications using them.
10	To design PCB and construct prototype of small projects
11	To understand elements and techniques of communication systems
12	To understand the principles and concepts of management
13	To understand various features of computer network and network operating systems.
14	To be aware of latest developments in Electronic/Telecom Industry.
15	To be aware of effect of electronic/telecom Industry on environment.

An Approach to Curriculum Design and Development Based upon Outcome Based Education (OBE) Philosophy as adopted for Sixth Revision of Curriculum of Government Polytechnic Aurangabad.

Introduction:

After conferring academic autonomy to 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. Our Institute, being Academically Autonomous since 1994, has been following the same practice and hence this sixth revision of curriculum for all programmes.

Curriculum, as per Colombo Plan Staff College Manila (1984), means ***'an educational programme designed, developed and implemented to attain predetermined educational objectives.'*** Therefore curriculum ought to be designed for achieving purpose, objectives, outcomes that are decided well in advance. 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) rationale, objectives/ outcomes, content, Learning -Teaching strategies (LTS) and finally student's assessment and evaluation.

We are in the era where technical manpower in general and engineering technicians in particular are required to solve or assist in solving engineering problems from nano – micro level to mega level (Jeff Lohmann 2009). 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 advance IT based tools and techniques in diagnosing faults and carry out maintenance. Further 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.

Therefore, the philosophy of curriculum development used in revising sixth curriculum has been Integrated – interdisciplinary in nature to achieve outcome based technical education .

Even though all prevailing & necessary apt theories of curriculum design are used in the curriculum development process the existing curriculum has been questioned for its ability to provide clearly stated learning outcomes and therefore it is right time that the revised curricula requires that it should give enough clarity as regards intended learning outcomes to all concerned – first to the student, then to the teachers and the industry, followed by all the other stakeholders. This meant that the curriculum should explicitly state as to what are the observable and measurable 'competencies' expected by the industry. Such 'competencies' comprising of measurable 'Course outcomes' in the 'cognitive domain', measureable associated practical outcomes in the form of practical exercises in the 'psychomotor domain' and measurable social skills related to the 'affective domain' will help the students and teachers in knowing the 'length, breadth and depth' of the course necessary to achieve the competency.

Therefore, Curriculum need to be outcome-based where competencies / program outcomes and course outcomes are measurable. 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 in signatory countries. It was the outcome based criteria, which was devised for the first time by Accreditation Board for Engineering and Technology (ABET), that is being followed in USA for grading programmes for their quality since 1998. It is the industry which made educational institutes to go for outcome based criteria popularly known as EC 2000 where main emphasis is over outcomes – what he/ she knows and what he/ she is able to do.

National Board of Accreditation (NBA) has been practicing outcome based criteria in grading educational programmes of institutes awarding diploma and degree in engineering and technology. In that case the board empowered to undertake exercise of accrediting programmes has developed indigenous criteria for diploma programmes as follows: -

i. Vision, mission and programme educational objectives
ii. Programme outcomes
iii. Programme curriculum
iv. Students performance
v. Faculty

vi. Facilities and technical support

vii. Academic support unit and teaching learning process

viii. Governance

ix. Institutional support and finance resources

x. 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.

Philosophy for Sixth Revision of Curriculum adopted at Government Polytechnic, Aurangabad :

Sixth revision of Curriculum 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.

As regards, sixth revision of curriculum, which is based primarily on Outcome Based Education philosophy, follows the following stages.

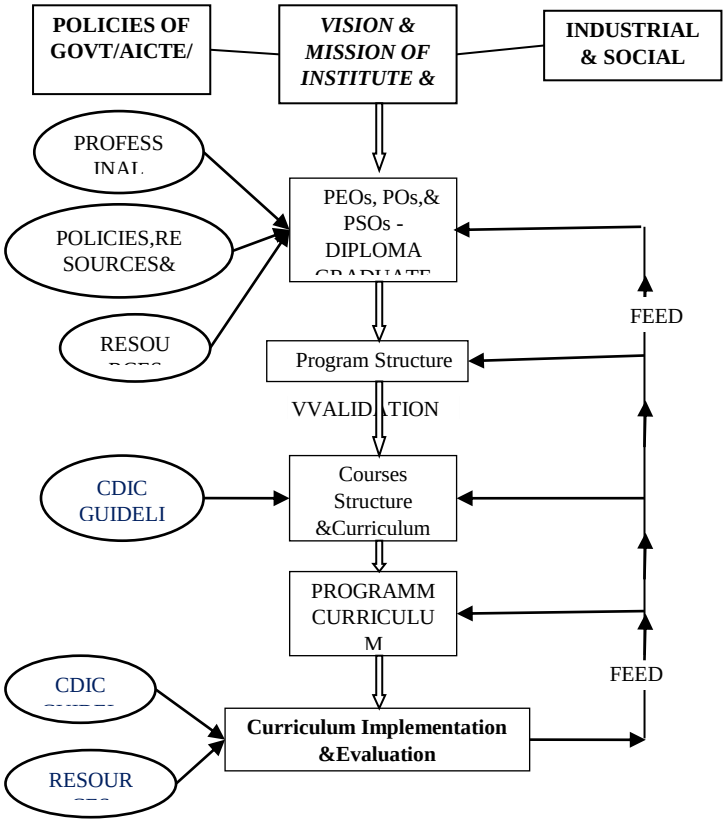
1. Occupation analysis.
2. Formulation of Vision & Mission of Institute/Department.
3. Formulation of Diploma graduate attributes and Programme Educational Objectives.
4. Evolve Program Structure.
5. Evolve Course structure, Course Competencies, Course Outcomes & Curriculum detailing of each course.
6. Approval of Curriculum
7. Implementation of Curriculum.

Approach to Curriculum Design and Development for Sixth Revision of Curriculum based upon above stages has been elaborated and depicted schematically as below.

In line with above stages, the institute ,under the guidance of NITTTR Bhopal organized the search conference/workshop involving industry personnel from several industries in the region covering all sectors related to 8 programmes run in the institute . This led to occupation analysis, knowing industry and society expectations as regards diploma graduate / engineer to arrive at profile of diploma engineers.

Institute also carried meetings and deliberations with stake holders to formulate the renewed Vision & Mission of Institute and departments as well. The Vision &

Mission so formulated have been considered as the terms of references in curriculum revision process.



CURRICULUM DEVELOPMENT APPROACH

Programme Educational Objectives (PEOs) – Programme educational objectives which are broad statements that describe the career and professional accomplishments that the programme is preparing graduates to achieve are formulated.

Programme Outcomes (POs) - As Mandated by NBA, following Programme Outcomes have been also the basis for curriculum revision. These Programme outcomes state the attainment of students' abilities, which the Department has to ensure that the stated outcomes are achieved before they are allowed to graduates.

1. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems.

2. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

3. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

4. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitations.

5. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

6. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

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

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

9. Communication: An ability to communicate effectively.

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

In the next stage following steps have been followed

i. Identification & validation of Programme Structure
ii. Validation of programme structure
iii. Detailing of course curricula
iv. Vetting of programme curriculum
v. Implementation and student's evaluation

Under the guidance of Programme wise Board of Studies (PBOS) , Course areas, levels, programme structure are worked and validated. In line with this structure, course structure, Teaching & Examination schemes are formulated. For each course, course rationale, course competency, course outcomes, content detailing, specification table, practical experiences along with instructional strategies/methods & student activities are also identified and validated by the PBOS.

Curricula of respective programme are presented before Board of Studies (BOS) for the final approval before it is implemented.

Implementation of curriculum involves , orienting faculty & staff for implementation, development lab manuals, learning resources , model question papers and training faculty for expertise in course areas (if required).

Mapping – Mapping is the process of representing, preferably in matrix form, the correlation among the parameters. It may be done for one to many, many to one, and many to many parameters. In curriculum development process COs are mapped with POs & PSOs to establish the correlation between COs & POs/PSOs.

Salient Features of Curriculum:

Curriculum of each programme comprises of 40 -45 courses with 194 credits 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. It is outcomes at five tiers viz. International &

Professional (after 3—5 years of graduation) registration, programme outcomes, course outcomes and major learning outcome of each unit are used to establish not only intra course and inter courses integration but also the programme outcome is getting linked to international and professional registration of diploma graduates.

The levels as stated above are defined as follows:

a. 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 courses are designed.

b. 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.

c. Allied - The courses related to Humanities and Social Sciences (H&SS) are a part of this level. They play a role of developing and human and social dimensions of personality of engineers.

d. 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

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

DIMENSIONS OF CURRICULUM:

a) Competency based curriculum development based on the competencies identified and validated by experts in construction industry.

b) Overall focus of Curriculum

- Developing competencies as prime focus.
- Team building
- Entrepreneurial skills
- Learning to learn
- Information collection/processing through computer.

c) Unified Approach to all courses

- Use of I. S. codes in appropriate course
- Quality control, safety, productivity etc as part of content in appropriate courses.
- Do’s and Don’t
- Diagnostic skills (case studies), thinking skills

- Interlinking of courses/ Integrated approach
- Project approach.

LIST OF INDUSTRIES VISITED

1) Mayuresh Enterprises
2) Luans Electronics , Chikalthana
3) Voltline, Aurangabad
4) Krish Automation, Aurangabad
5) RJ Engineers, MIDC,Aurangabad

8) NECESSITY OF CURICULUM REVISION

1) In built continuous process
2) Feedback from Industries
3) Feedback from Faculty & Students

9) SCHEME AT A GLANCE:

- Total number of courses offered : 53+10
- Number of compulsory courses : 39
- Number of optional courses : 03+02
- Total courses to be opted : 42+2

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SEMESTER WISE COURSE STRUCTURE OF NEW CURRICULUM: 6TH REVISION 10TH PASS

Year 1		Year 2		Year 3	
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Basic Maths 6G101 (3+1)	Engineering Maths 6G102 (3+1)	EDC –I 6X204 (4+2)	Electronic Workshop 6X207 (0+4)	Microwave & Satellite communication 6X411 (3+2)	IM 6G305 (3+2)
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GOVERNMENT POLYTECHNIC, AURANGABAD								
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES								
SIXTH CURRICULUM REVISION								
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION								
PROGRAM STRUCTURE								
Sr. No.	Level	No. of Credits	No. of Courses		Total Exam Heads		Total Marks	
			Compulsory	Optional	Theory	Non Theory	Theory	Non Theory
01	**Semester I:**	23	07	--	03	04	375	250
02	**Semester II:**	31	07	01	04	04	550	175
03	**Semester III:**	33	06	01	05	02	750	25
04	**Semester IV:**	37	06	01	05	02	750	125
05	**Semester V:**	35	07	01	05	03	750	275
06	**Semester VI:**	35	06	01	04	03	575	300
	Total	**194**	39	05	26	18	3750	1150

1.	Total courses offered	51 + 10
2.	Compulsory courses	39
3.	Optional courses	03 + 02
4.	Total courses	44
5.	Total credits	194
6.	Total marks	**4900**

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMESTER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
FIRST SEMESTER (I): COURSES													
Sr. No.	**Course Code**	**Course name**	**Sub Abbr.**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6G101	Basic Mathematics	M1	03 + 01	--	04	I	20	80	--	--	--	100
02	6G103	Engineering Physics	PH	03	02	05	I	20	80	25	25	--	150
03	6G201	Engineering Graphics	EG	02	02	04	I	--	--	50	50	--	100
04	6G203	Basics of Computer Systems	BCS	00	02	02	I	--	--	25	25	--	50
05	6X201	Introduction to Instruments	IICE	00	02	02	I	--	-	--	50	--	50
06	6G301	English	ENG	02	02	04	I	20	80	--	25	--	125
07	6G303	Development of Life Skills	DLS	00	02	02	I	--	--	--	50	--	50
	TOTAL			11	12	23		60	240	100	225	--	625

	Scheme at a Glance	
1.	Total Number of courses offered	07
2.	Number of Compulsory Courses	07
3.	Number of Optional Courses	--
4.	Total courses	07
5.	Total credits	23
6.	Total marks	625

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMESTER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
SECOND SEMESTER (II): COURSES													
Sr. No.	**Course Code**	**Course name**	**Co Abbr**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6G102	Engineering Mathematics	M2	03+01	--	04	II	20	80	--	--	--	100
02	6G104	Engineering Chemistry	CH	03	02	05	II	20	80	25	25	--	150
03	6G202	Workshop Practice	WSP	00	03	03	II	--	--	--	50	--	50
04	6X202	Electrical Technology	ETG	04	02	06	II	20	80	25	25	--	150
05	6X203	Programming Language	CP	02	04	06	II	20	80	25	25	--	150
06	6G302	Communication Skill	CS	01	02	03	II	--	--	--	50	25	75
07	6G304	Environmental Science	EVS	00	02	02	II	--	--	--	50	--	50
08		Non Exam Credit	NEC	00	02	02	II	--	--	--	--	--	--
	Total			14	17	31		80	320	75	225	25	725

	Scheme at a Glance	
1.	Total Number of courses offered	07+10
2.	Number of Compulsory Courses	07
3.	Number of Optional Courses	01
4.	Total courses	08
5.	Total credits	31
6.	Total marks	725

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMSETER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
THIRD SEMESTER (III): COURSES													
Sr. No.	**Course Code**	**Course name**	**Sub Abbr.**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6X204	Electronic Devices and Circuits –I	EDC-I	04	02	06	III	20	80	25	25	--	150
02	6X205	Digital Electronics	DE	04	02	06	III	20	80	25	25	--	150
03	6X206	Circuits & Networks	CKN	04	02	06	III	20	80	25	25	--	150
04	6X208	Professional Practice	PP	00	02	02	III	--	--	--	25	--	25
05	6X209	Electronic Measurement and Instruments	EMI	03	02	05	III	20	80	25	25	--	150
06	6X403	Electronics Communication-I	EC-I	04	02	06	III	20	80	25	25	--	150
07		Non Exam Credit	NEC	00	02	02	III	--	--	--	--	--	--
	TOTAL			19	14	33		100	400	125	150	--	775

	Scheme at a Glance	
1.	Total Number of courses offered	06+10
2.	Number of Compulsory Courses	06
3.	Number of Optional Courses	01
4.	Total courses	07
5.	Total credits	33
6.	Total marks	775

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMSTER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
FOURTH SEMESTER (IV): COURSES													
Sr. No.	**Course Code**	**Course name**	**Sub Abbr.**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6X207	Electronics Workshop	EWS	00	04	04	IV	--	--	25	50	--	75
02	6G306	Entrepreneur-ship Development	EDP	02	02	04	IV	--	--	--	50	--	50
03	6X402	Linear Integrated Circuits	LIC	03	04	07	IV	20	80	25	25	--	150
04	6X405	Electronics Devices and Circuits –II	EDC-II	03	04	07	IV	20	80	25	25	--	150
05	6X408	Microcontroller	MIC	03	02	05	IV	20	80	25	25	--	150
06	6X410	Electronics Communication-II	EC-II	03	02	05	IV	20	80	25	25	--	150
07	**Any one from Group ELECTIVE –I**												
a)	6X414	Automobile Electronics –I	AE-I	03	02	05	IV	20	80	25	25	--	150
b)	6X415	Digital Circuits & Systems	DCS	03	02	05		20	80	25	25	--	150
c)	6X416	Instrumentation & Control-I	INS-I	03	02	05		20	80	25	25	--	150
d)	6X417	Industrial Automation & Control-I	CAN-I	03	02	05		20	80	25	25	--	150
	In- Plant Training of 2/3/4 weeks between 4th& 5th Semester [Summer Vacation]: Report Submission (PA) during 5th Semester ESE (OR) (Internal)												
	TOTAL			**17**	**20**	**37**		**100**	**400**	**150**	**225**	--	**875**

	Scheme at a Glance				
1.	Total Number of courses offered	6+4	5.	Total credits	37
2.	Number of Compulsory Courses	06			
3.	Number of Optional Courses	01	6.	Total marks	875
4.	Total courses	07			

GOVERNMENT POLYTECHNIC, AURANGABAD

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

SEMESTER WISE COURSE STRUCTURE

PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

FIFTH SEMESTER (V): COURSES

Sr. No.	Course Code	Course Name	Co Abbr	Teaching Scheme				Examination Scheme					
				TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
01	6X411	Microwave & Satellite communication	MSC	03	02	05	V	20	80	--	25	25	150
02	6X404	Control Systems & PLC	CS & PLC	03	02	05	V	20	80	--	25	25	150
03	6X401	Electronics Circuit Design	ECD	03	02	05	V	20	80	--	25	25	150
04	6X407	Digital communication	DC	03	02	05	V	20	80	25	25	--	150
05	6X412	Computer Hardware & Networking	CHN	02	02	04	V	--	--	50	50	--	100
06	6X501	Project –I [Seminar]	SEM	00	02	02	V	--	--	--	50	25	75
07	**Any one from Group ELECTIVE –II**												
a)	6X506	Automobile Electronics –II	AE-II	03	02	05		20	80	25	25	--	150

b)	6X507	Automation & Control - II	AC-II	03	02	05	V	20	80	25	25	--	150
c)	6X508	Advanced Micro-controller	AMIC	03	02	05		20	80	25	25	--	150
d)	6X509	Instrumentation & Control - II	IC-II	03	02	05		20	80	25	25	--	150
08	In- Plant Training of 2/3/4/5/6 weeks between 4th& 5th Semester [Summer Vacation]: Report Submission (PA) during 5th Semester ESE (OR) (Internal)												
	6X503	In-Plant Training	IPT	00	04	04	V	--	--	--	50	50	100
	TOTAL			17	18	35		100	400	175	275	75	1025

	Scheme at a Glance	
1.	Total Number of courses offered	07+04
2.	Number of Compulsory Courses	07
3.	Number of Optional Courses	01
4.	Total courses	08
5.	Total credits	35
6.	Total marks	1025

GOVERNMENT POLYTECHNIC, AURANGABAD

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

SEMSETER WISE COURSE STRUCTURE

PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

SIXTH SEMESTER (VI): COURSES

Sr. No.	Course Code	Course name	Co Abbr	Teaching Scheme				Examination Scheme					
				TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
01	6G305	Industrial Management	IM	03	02	05	VI	20	80	--	25	--	125
02	6X409	Maintenance of Electronic Equipments	MEE	00	04	04	VI	--	--	--	25	25	50
03	6X505	Mobile & Fiber Optic Communication.	MFO	04	02	06	VI	20	80	25	25	--	150
04	6X413	Software Lab : MATLAB	MLAB	01	04	04	VI	-	--	--	50	50	100
05	6X406	Power Electronics	PE	04	02	06	VI	20	80	25	25	--	150
06	6X502	Project –II	PROJ	00	04	04	VI	--	--	--	100	50	150
07	**Any one from Group ELECTIVE –III**												
a)	6X510	Reliability and Quality management	RQM	03	02	05	VI	20	80	--	25	25	150
b)	6X511	Electronic Product Design	EPD	03	02	05		20	80	--	25	25	150
c)	6X512	Embedded systems	EBS	03	02	05		20	80	--	25	25	150
d)	6X513	Digital System Design using VHDL	DSD-VHDL	03	02	05		20	80	--	25	25	150
		TOTAL		15	20	35		80	320	50	275	150	875

	Scheme at a Glance	
1.	Total Number of courses offered	06+04
2.	Number of Compulsory Courses	06
3.	Number of Optional Courses	01
4.	Total courses	07

5.	Total credits	35	
6.	Total marks	875	

GOVERNMENT POLYTECHNIC, AURANGABAD								
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES								
SIXTH CURRICULUM REVISION								
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION								
PROGRAM STRUCTURE								
Sr. No.	Level	No. of Credits	No. of Courses		Total Exam Heads		Total Marks	
			Compulsory	Optional	Theory	Non Theory	Theory	Non Theory
01	**Foundation**	18	04	--	04	--	500	--
02	**Basic Technology**	52	12	--	06	06	900	350
03	**Allied**	24	06	02	02	06	250	225
04	**Applied**	74	13	01	11	03	1650	250
05	**Diversified**	26	04	02	03	03	450	325
	Total	194	39	05	26	18	3750	1150

1.	Total courses offered	51 + 10
2.	Compulsory courses	39
3.	Optional courses	03 + 02
4.	Total courses	44
5.	Total credits	194
6.	Total marks	**4900**

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMESTER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
FOUNDATION COURSES:													
Sr. No.	**Course Code**	**Course name**	**Co Abbr.**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6G101	Basic Mathematics	M1	03 + 01	--	04	I	20	80	--	--	--	100
02	6G102	Engineering Mathematics	M2	04	--	04	II	20	80	--	--	--	100
03	6G103	Engineering Physics	PH	03	02	05	I	20	80	25	25	--	150
04	6G104	Engineering Chemistry	CH	03	02	05	II	20	80	25	25	--	150
	TOTAL			14	04	18		80	320	50	50	--	500

	Scheme at a Glance	
1.	Total Number of courses offered	04
2.	Number of Compulsory Courses	04
3.	Number of Optional Courses	--
4.	Total courses	04
5.	Total credits	18
6.	Total marks	500

GOVERNMENT POLYTECHNIC, AURANGABAD

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

SEMESTER WISE COURSE STRUCTURE

PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

BASIC TECHNOLOGY COURSES:

Sr. No.	Course Code	Course name	Co Abbr	Teaching Scheme				Examination Scheme					
				TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
01	6G201	Engineering Graphics	EG	02	02	04	I	--	--	50	50	--	100
02	6G202	Workshop Practice	WSP	00	03	03	II	--	--	--	50	--	50
03	6G203	Basics of Computer Systems	BCS	00	02	02	I	--	--	25	25	--	50
04	6X201	Introduction to Instruments	IICE	00	02	02	I	--	-	--	50	--	50
05	6X202	Electrical Technology	ETG	04	02	06	II	20	80	25	25	--	150
06	6X203	Programming Language	CP	02	04	06	II	20	80	25	25	--	150
07	6X204	Electronic Devices and Circuits –I	EDC-I	04	02	06	III	20	80	25	25	--	150
08	6X205	Digital Electronics	DE	04	02	06	III	20	80	25	25	--	150
09	6X206	Circuits & Networks	CKN	04	02	06	III	20	80	25	25	--	150
10	6X207	Electronics Workshop	EWS	00	04	04	IV	--	--	25	50	--	75
11	6X208	Professional Practice	PP	00	02	02	III	--	--	--	25	--	25
12	6X209	Electronic Measurement and Instruments	EMI	03	02	05	III	20	80	25	25	--	150
	Total			23	29	52		120	480	250	400	--	1250

Scheme at a Glance

1.	Total Number of courses offered	12
2.	Number of Compulsory Courses	12
3.	Number of Optional Courses	--
4.	Total courses	12
5.	Total credits	52
6.	Total marks	1250

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMSETER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
ALLIED COURSES:													
Sr. No.	**Course Code**	**Course name**	**Sub Abbr.**	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6G301	English	ENG	02	02	04	I	20	80	--	25	--	125
02	6G302	Communication Skill	CS	01	02	03	II	--	--	--	50	25	75
03	6G303	Development of Life Skills	DLS	00	02	02	I	--	--	--	50	--	50
04	6G304	Environmental Science	EVS	00	02	02	II	--	--	--	50	--	50
05	6G305	Industrial Management	IM	03	02	05	VI	20	80	--	25	--	125
06	6G306	Entrepreneur-ship Development	EDP	02	02	04	IV	--	--	--	50	--	50
07/08		Non Exam Credit	NEC	00	02+02	02+02	II/III	--	--	--	--	--	--
	TOTAL			08	16	24		40	160	--	250	25	475

	Scheme at a Glance	
1.	Total Number of courses offered	06+10
2.	Number of Compulsory Courses	06
3.	Number of Optional Courses	02
4.	Total courses	08
5.	Total credits	24
6.	Total marks	475

GOVERNMENT POLYTECHNIC, AURANGABAD

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

SEMSTER WISE COURSE STRUCTURE

PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

APPLIED COURSES:

Sr. No.	Course Code	Course name	Sub Abbr.	Teaching Scheme				Examination Scheme					
				TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
01	6X411	Microwave & Satellite Communication	MSC	03	02	05	V	20	80	25	25	--	150
02	6X402	Linear Integrated Circuits	LIC	03	04	07	IV	20	80	25	25	--	150
03	6X403	Electronics Communication-I	EC-I	04	02	06	III	20	80	25	25	--	150
04	6X404	Control Systems& PLC	CS & LC	03	02	05	V	20	80	25	25	--	150
05	6X405	Electronics Devices and Circuits –II	EDC-II	03	04	07	IV	20	80	25	25	--	150
06	6X406	Power Electronics	PE	04	02	06	VI	20	80	25	25	--	150
07	6X407	Digital Communication	DE	03	02	05	V	20	80	25	25	--	150
08	6X408	Microcontroller	MIC	03	02	05	IV	20	80	25	25	--	150
09	6X409	Maintenance of Electronic Equipments	MEI	00	04	04	VI	--	--	--	25	25	50
10	6X410	Electronics Communication-II	EC-II	03	02	05	IV	20	80	25	25	--	150
12	6X412	Computer Hardware &Networking	CHN	02	02	04	V	-	--	--	50	50	100
13	6X413	Software Lab -MATLAB	M-LAB	01	04	05	V	--	--	50	50	--	100
14	**Any one from Group ELECTIVE –I**												
a)	6X414	Automobile	AE-I	03	02	05		20	80	25	25	--	150

		Electronics –I					IV						
b)	6X415	Digital Circuits & Systems	DCS	03	02	05		20	80	25	25	--	150
c)	6X416	Instrumentation & Control-I	INS-I	03	02	05		20	80	25	25	--	150
d)	6X417	Industrial Automation & Control-I	CAN-I	03	02	05		20	80	25	25	--	150
	TOTAL			38	36	74		220	880	325	400	75	1900

Scheme at a Glance

1.	Total Number of courses offered	13+04	5.	Total credits	74
2.	Number of Compulsory Courses	13			
3.	Number of Optional Courses	1	6.	Total marks	1900
4.	Total courses	14			

GOVERNMENT POLYTECHNIC, AURANGABAD													
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES													
SEMESTER WISE COURSE STRUCTURE													
PROGRAM : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION													
DIVERSIFIED COURSES:													
Sr. No.	**Course Code**	**Course Name**	Co Abbr.	**Teaching Scheme**				**Examination Scheme**					
				TH	**PR**	**CR**	**TERM**	**PT**	**TH**	**PR**	**TW**	**OR**	**TOTAL**
01	6X501	Project –I [Seminar]	SEM	00	02	02	V	--	--	--	50	25	75
02	6X502	Project –II	PROJ	00	04	04	VI	--	--	--	100	50	150
03	6X503	In-Plant Training	IPT	00	04	04	V	--	--	--	50	50	100
	In- Plant Training of 2/3/4 weeks between 4th& 5th Semester [Summer Vacation]: Report Submission (PA) during 5th Semester ESE (OR) (Internal) AND/ OR In- Plant Training of 2/3/4/5/6 weeks between 4th& 5th Semester [Summer Vacation]: Report Submission (PA) during 5th Semester ESE (OR) (Internal)												
04	6X411	Microwave & Satellite communication	MSC	03	02	05	V	20	80	25	25	--	150
05	**Any one from Group ELECTIVE –II**												
a)	6X506	Automobile Electronics –II	AE-II	03	02	05	V	20	80	25	25	--	150
b)	6X507	Automation & Control -II	ECD	03	02	05		20	80	25	25	--	150
c)	6X508	Advanced Micro-controller	AMIC	03	02	05		20	80	25	25	--	150
d)	6X509	Instrumentation & Control - II	IC-II	03	02	05		20	80	25	25	--	150
06	**Any one from Group ELECTIVE –III**												
a)	6X510	Reliability and Quality management	RQM	03	02	05	VI	20	80	--	25	25	150
b)	6X511	Electronic Product Design	EPD	03	02	05		20	80	--	25	25	150
c)	6X512	Embedded	EBS	03	02	05		20	80	--	25	25	150

		Systems											
d)	6X513	Digital System Design using VHDL	DSD-VHDL	03	02	05		20	80	--	25	25	150
	TOTAL			9	16	25		60	240	50	275	150	775

	Scheme at a Glance	
1.	Total Number of courses offered	04+10
2.	Number of Compulsory Courses	04
3.	Number of Optional Courses	02
4.	Total courses	06
5.	Total credits	25
6.	Total marks	775

Sixth Curriculum Revision:[2017-2018] Diploma Awarded Courses

Sr. No.	Course Code	Course name	Sub Abbr.	Teaching Scheme				Examination Scheme					
				TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
Diversified level All Courses													
01	6X505	Mobile & Fiber Optic Communication	MFO	04	02	06	VI	20	80	25	25	--	150
02	**Any one from Group ELECTIVE –II**												
a)	6X506	Automobile Electronics – II	AE-II	03	02	05	V	20	80	25	25	--	150
b)	6X507	Automation & control II	A.C- II	03	02	05	V	20	80	25	25	--	150
c)	6X508	Advance Micro-controller	AMIC	03	02	05	V	20	80	25	25	--	150
d)	6X509	Instrumentation & Control - II	IC-II	03	02	05	V	20	80	25	25	--	150
03	**Any one from Group ELECTIVE –III**												
a)	6X510	Reliability and Quality Management	RQM	03	02	05	VI	20	80	--	25	25	150
b)	6X511	Electronic Product Design	EPD	03	02	05	VI	20	80	--	25	25	150
c)	6X512	Embedded Systems	EBS	03	02	05	VI	20	80	--	25	25	150
d)	6X513	Digital System Design using VHDL	DSD-VHDL	03	02	05	VI	20	80	--	25	25	150
Project & Seminar													
04	6X501	Project –I [Seminar]	SEM	00	02	02	V	--	--	--	50	25	75
05	6X502	Project –II	PROJ	00	04	04	VI	--	--	--	100	50	150
Non-Theory Courses													
06	6X412	Computer	CHN	02	02	04	V	-	--	--	50	50	100

		Hardware & Networking											
07	6X208	Professional Practice	PP	00	02	02	III	--	--	--	25	--	25
Any Five Theory Courses													
08	6X402	Linear Integrated Circuits	LIC	03	04	07	IV	20	80	25	25	--	150
09	6X403	Electronics Communicati on-I	EC-I	04	02	06	III	20	80	25	25	--	150
10	6X401	Electronic Circuit Design	ECD	03	02	05	V	20	80	25	25	--	150
11	6X407	Digital Communicati on	DC	03	02	05	V	20	80	25	25	--	150
12	6X408	Microcontroll er	MIC	03	02	05	IV	20	80	25	25	--	150
13	**Any one from Group ELECTIVE –I**												
a)	6X414	Automobile Electronics –I	AE-I	03	02	05	IV	20	80	25	25	--	150
b)	6X415	Digital Circuits & Systems	DCS	03	02	05	IV	20	80	25	25	--	150
c)	6X416	Instrumenta-tion& Control-I	IC-I	03	02	05	IV	20	80	25	25	--	150
d)	6X417	Automation & Control-I	AC-I	03	02	05	IV	20	80	25	25	--	150
				31	30	61		180	720	200	450	150	1700
Total				Total credits =61				TH = 900		PR = 800			1700

Co-ordinator (ET)
Curriculum Revision

HOD [E & TC]

Government Polytechnic, Aurangabad.

(An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre (6th Revision : Outcome Based Education - 2017-18)

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING

First Semester Courses

Sr. No.	Course Code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)							
			Theory	Practical	Tutorial	Total Credit	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Compulsory/ Optional
1	6G101	Basic Mathematics	3	--	1	4	20	80	--	--	--	100	3	Compulsory
2	6G103	Engineering Physics	3	2	--	5	20~	80~	25@	--	25	150	3	Compulsory
3	6G201	Engineering Graphics	2	2	2	4	--	--	50@	--	50	100	0	Compulsory
4	6G203	Basics of Computer Systems	--	2	--	2	--	--	25@	--	25	50	0	Compulsory
5	6X201	Introduction to Instruments	--	2	--	2	--	--	--	--	50	50	0	Compulsory
6	6G301	English	2	2	--	4	20	80	--	--	25	125	3	Compulsory
7	6G303	Development of Life Skills	--	2	--	2	--	--	--	25@	25	50	0	Compulsory
		Total	**10**	**12**	**3**	**23**	**60**	**240**	**100**	**25**	**200**	**625**		

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

Head of Department

Govt. Polytechnic, Aurangabad

Government Polytechnic, Aurangabad.

(An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre (6th Revision : Outcome Based Education - 2017-18)

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING

Second Semester Courses

Sr. No	Course Code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)							
			Theory	Practical	Tutorial	Total Credit	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Compulsury/ Optional
1	6G102	Engineering Mathematics	3	--	1	4	20	80	--	--	--	100	3	Compulsory
2	6G104	Engineering Chemistry	3	2	--	5	20~	80~	25@	--	25	150	3	Compulsory
3	6G202	Workshop Practice	--	3	--	3	--	--	--	--	50	50	--	Compulsory
4	6X202	Electrical Technology	4	2	--	6	20	80	25@	--	25	150	3	Compulsory
5	6X203	Programming Language	2	4	--	6	20	80	25@	--	25	150	3	Compulsory
6	6G302	Communication Skills	1	2	--	3	--	--	--	25@	50	75	--	Compulsory
7	6G304	Environmental Science	--	2	--	2	--	--	--	--	50	50	--	Compulsory
8	6G311-322	Non Exam Credit Courses	--	2	--	2	--	--	--	--	--	--	--	Optional
		Total	**13**	**17**	**1**	**31**	**80**	**320**	**75**	**25**	**225**	**725**		

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

Head of Department
Govt. Polytechnic, Aurangabad

COURSE TITLE **BASIC MATHEMATICS**

COURSE CODE **6G101**

Diploma Programme in which this course is offered	Semester in which offered
CE/ME/EE/ET/IT/CO/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 analyze 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

Apply rules of Logarithms in solving simple engineering problems

3.1 Solve simultaneous equations using concepts of Determinants and Matrices

3.2 Solve simple engineering problems using concepts of Partial Fractions

3.3 Solve simple engineering problems by applying formulae of trigonometry.

3.4 Solve simple engineering problem of function using the different definition of function

3.5 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 2 and 3	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) 2.2 Definition of matrix: Type of matrix: viz.- null, row, column, Square, diagonal, scalar, unit, Triangular. 2.3 Algebra of matrices–addition, subtraction and multiplication. 2.4 Transpose of a matrix. 2.5 Adjoint of a matrix Relation. 2.6 Inverse of matrix by adjoint method. 2.7 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	6.1 Definition 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

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

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	PSO 2	PSO 3
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	-	-	-

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-coordinator
science and Humanities

COURSE TITLE ENGINEERING PHYSICS

COURSE CODE 6G103

Diploma Programmes in which this course is offered	Semester in which offered
ME/CE/ET/EE/CO/IT/AE	FIRST

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 : General Properties 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 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

COURSETITLE : ENGINEERING GRAPHICS (EG)

COURSE CODE : 6G201

DIPLOMA PROGRAMME IN WHICH THIS COURSE IS OFFERED	SEMESTER
ME, CE, EE, E&TC, 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. forplanning andlayout. 4 Choose appropriate scale factor for thedrawing.	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 itsuse, 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**	1. Draw the orthographic views of object. 2. Interpret given orthographic views 3. and imagine theactual shape of thecomponent.	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. 1 Draw isometric view of given object. 2. 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 onsketch book) 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**	Modelsand 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	SidheswarShastri , 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	PSO3	No. of hours allocated in curriculum
CO1	Draw geometrical figures and scales.	3	3	2	3	-	-	-	-	3	2	2	2	3	6
CO2	Drawing of various engineering curves.	3	3	2	3	-	-	-	-	3	2	2	2	3	8
CO3	Draw orthographic views of given components.	3	3	2	3	-	-	-	-	3	2	2	2	3	8
CO4	Draw isometric views of given component.	3	3	2	3	-	-	-	-	3	2	2	-	3	8
CO5	Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.	3	3	2	3	-	-	-	-	3	2	2	-	3	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
Common to all branches (CE/ME/EE/ET/CO/IT/AE/DDGM)	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.
	2a. Create, edit and save word document using basic text formatting features, page setup options & print	2.1 Overview of Word processor 2.2 Basics of Font type, size, colour 2.3 Effects like Bold, italic , underline, Subscript and superscript,

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit-2 : Word Processor	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.	2.4 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. 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, count if, roundup, sin, cos. 3.6 Introduction to charts, overview of different types of charts available with Excel.

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
		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. 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	SatyaPrakashan, 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	HPscanner ,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)

S No	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- INTRODUCTION TO INSTRUMENTS

COURSE CODE 6X201

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Electronics & Telecommunication Engineering	FIRST

1. RATIONALE

This course forms the foundation of all courses in Electronics engineering. It deals with basic electronic measuring equipments, their front panel controls and their use for testing and measurement, also introduces the students with working principles, block diagram and advance features of consumer electronics appliances which in-turn will develop skills to diagnosis fault and rectification of that in systematic way. Knowledge so gained would also help in working in production units of these consumer gadgets. Students may also start their own repair workshops and may engage in fruitful self employment.

2. COMPETENCY

I. Handle electronics instruments and accessories properly and skillfully.

II. Maintain various consumer electronic appliances.

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
0	-	2	2	--	--	---	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 Examiner.

4. COURSE OUTCOMES

1) Perform requisite measurements to a defined accuracy, via proper choice of instrument.
2) Acquire knowledge of front panel & controls of various instruments for measurement.
3) Set accurate voltage using appropriate power supply.
4) Select proper instrument with respect to parameter and range.
5) Measure values of L-C-R using LCR Q meter.
6) Select Proper home appliances.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit –I Basic Parameter Measurements	1a. Measure AC and DC Voltage/current using AC/ DC voltmeter and Ammeter. 1b. Measure AC & DC Voltage/current using AC/DC using Analog and Digital Multimeter. 1c. Perform requisite measurements to a defined accuracy, via proper choice of instrument.	**Voltmeter & Ammeter** 1.1 Comparison between different AC, DC voltmeters and Ammeters 1.2 AC, DC Voltage and current measurement using voltmeter and Ammeter. **Multimeter(Analog & Digital)** 1.3 Operating controls & their functions 1.4 Specifications & List of applications. 1.5 AC, DC Voltage and current measurement and component testing using multimeter.
Unit– II Electronic Test Equipments-I	2a. Describe the features associated with front panel controls of Power supply. 2b. Set accurate voltage using appropriate power supply. 2c. Acquire nowledge of front panel controls of CRO for measurement of amplitude,	**Power Supply** 2.1 Regulated DC power supply, concept of dual power supply 2.2 Front Panel controls & their functions. 2.3 List of applications.

	frequency and time period.	**CRO** 2.4 Front Panel controls & their functions. 2.5 Specifications & List of applications. 2.6 Measurement of Amplitude, frequency and time period.
Unit– III Electronic Test Equipments-II	3a. Describe the features associated with front panel controls of Signal/ Function Generator 3b. Measure values of L-C-R using LCR Q meter. 3c. Select proper instrument with respect to parameter and range.	**Function Generator** 3.1 Front Panel controls & their functions. 3.2 Amplitude & frequency changing with coarse and fine control. 3.3 Specifications & List of applications **LCR Q meter** 3.4 Front Panel controls & their functions. 3.5 Precision measurement of components.
Unit– IV Home Appliances	4a. Describe Features of Television. 4b. Describe Features of Mobile Phone. 4c. Describe features of Dish. 4d. Describe features of microwave oven. 4e. Select Proper home appliances.	4.1 Comparison of Televisions with specifications. 4.2 Generations & comparison of Mobile Phones with specifications. 4.3 Comparison of Dish with specifications 4.4 Microwave oven-Types, safety instructions, specifications.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Not Applicable

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	01	AC&DC voltage measurement using voltmeter	2
2	01	AC&DC current measurement using Ammeter	2
3	01	Measure various parameters Viz. voltage, current, resistance using Analog & Digital Multi meter.	2
4	01	Prepare report on manufacturers of Digital Multimeter	2
5	02	Identify the features and use of the front panel controls of CRO.	2
6	02	Measure voltage, frequency and periodic time of different waves using CRO.	2
7	02	Prepare report on Manufacturers of CRO.	2
8	03	Identify the features and use of the Function Generator.	2
9	03	Observe the effect of DC shift, Amplitude & Frequency change with coarse and fine control in a signal/ function generator.	2
10	03	Measure component values using LCR Q-meter.	2
11	03	Prepare report on Manufacturers of Function Generator & LCR Q-meter.	2
12	04	Verify the performance of TVs. Compare performance parameters of at least three brands.	4
13	04	Operate and note down features of a mobile handset trainer.	2
14	04	Observe components of DTH system & its installation procedure.	2
15	04	Test various functions of microwave oven. **Micro-projects**: [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. Testing of Electronic kit/ Circuit using Multimeters 2. CRO: Use of Lissajous figures for testing Components 3. Installation and Testing of DTH System 4. Operation of TV with LED display 5. Testing of Transformers 6. Testing of Electronic Circuits 7. Display Board of Mobile Handset: Components/ Sections.	2
			32

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

i. Explore laboratory data manuals from different manufacturers handbooks. Present seminar on advanced Instrumentation topic.

ii. Conduct market survey for latest home appliances and compare specifications of reputed brands and prepare a report

iii. Make visit to service centers of gadgets covered in curriculum and if possible work there for some days on voluntarily basis during holidays.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Visit of Electronics Instruments calibration laboratories.

ii. Show video/animation films to demonstrate the working principles, constructional features, testing and maintenance procedures of various home appliances.

iii. Arrange a visit to nearby manufacturer of consumer electronics products.

iv. Use Flash/Animations to explain the working of different electronics control circuits.

v. Students must be encouraged for self directed learning to improve LOs/ COs.

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1	Electrical and Electronic Measurements	A.K.Sawhney	Dhanpat Rai, New Delhi, latest edition
2	Electronic Instrumentations	H S Kalsi	Tata McGraw-Hill , latest edition
3	Consumer Electronic	Bali S.P.	Pearson Education India, latest edition
4	Wireless Communications Principles and practice	T.S.Rappaport	Pearson Education
5	Modern Television practices	Gulati R.R.	New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Power Supply	Regulated DC Power supply: ± 5V, ± 30v [Dual track]
2.	CRO	Dual Channel with component Test DC - 20 MHz BW
3.	Function generator	Frequency range upto 10 MHz Fast Rise/Fall time (≤ 20ns)
4.	LCR Q meter	Comprehensive range of fnctions, L,C,R,Q Test frequency standard 100 Hz / 1 kHz
5.	DTH System trainer KIt	Comprehensive learning solution on DTH. Functional block diagram indicated on main board. Fault creation and diagnosis.
6.	Mobile Handset trainer kit	Power supply requirement : 230V AC, 50Hz STD / ISD facility, Caller line dentification Single PCB Design. Fault creation and diagnosis
7.	Microwave Oven	General Requirement : The microwave oven shall be simple in operation

12. LEARNING WEBSITE & SOFTWARE

1. www.engineersgarage.com
2. www.youtube.com
3. www.wikipedia.com
4. www.learnerstv.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	Perform requisite measurements to a defined accuracy, via proper choice of instrument.	1	2	3	2								
2	Acquire knowledge of front panel & controls of various instruments for measurement.		2	3	1								
3	Set accurate voltage using appropriate power supply.		2	3									
4	Select proper instrument with respect to parameter and range.		2	3	2								
5	Measure values of L-C-R using LCR Q meter.		3	3	1								
6	Select Proper home appliances.		2								3		
	Total Strength		**2**	**3**	**1**						**1**		

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	L.B.Kamkhede	Lecturer in Electronics and Telecommunication Engineering, Govt. Polytechnic,Aurangabad
2	R. A. Burkul	Lecturer in Electronics and Telecommunication Engineering, Govt. Polytechnic,Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE ENGLISH
COURSE CODE 6G301

Diploma Programme in which this course is offered	Semester in which offered
Common to all programs	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 not 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**	125
2	-	2	4	80	20	-	25*	
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. 1b. Write summary of the text 1c. Responding to the questions from the text 1d. Express ideas and views on learned topics	**Text from the book & Vocabulary Building** 1.1. Man Versus Machine - M. K. Gandhi 1.2. Say No to Plastic Bags 1.3. Interview of Dr.A.P.J. Abdul Kalam 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 4.3 Problems 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 create an 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 favorite 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: DEVELOPMENT OF LIFE SKILLS

COURSE CODE: 6G303

Diploma Programme in which this course is offered	Semester in which course is offered
CE/ME/**E & TC**/EE/AE/DDGM/CO/IT	FIRST

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 (OR)**	**PA**	
--	--	2	2	--	--	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**	5a. Manage health for personal efficiency. 5b. Describe Stress Management 5c. Use strategies to overcome stress 5d 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
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.*

6G303 GPA DEVELOPMENT OF LIFE SKILLS

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
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.
- 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

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

B) Software/Learning Websites:

Websites related to soft skills.

https://en.wikipedia.org/wiki/Life_skills

https://www.skillsyouneed.com/general/life-skills.html

https://www.iyfnet.org/sites/default/files/FieldNotes05TechLifeSkills.pdf

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	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		

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

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE **ENGINEERING MATHEMATICS**

COURSE CODE **6G102**

Diploma program in which course is offered	Semester in which course is offered
CE/ME/EE/**E& TC** /IT/CO/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	40	80

7. SUGGESTED LIST OF TUTORIAL

1) The exercises sould 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 program.

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	-	-	-	-	-	-	-	-

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-ordinator science and Humanities

COURSE TITLE: ENGINEERING CHEMISTRY

COURSE CODE: 6G104

Diploma Programme in which this course is offered	Semester in which offered
ME/CE/EE//**ET**/CO/IT/AE	**SECOND**

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

2. 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.

3. 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.	3.1 Definition of corrosion 3.2 Atmospheric corrosion or dry Corrosion, corrosion due to oxygen , different types of film formation. 3.3 Electrochemical Corrosion Hydrogen evolution mechanism. 3.4 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 potability. 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.

4. 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.

5. 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,	2

		universal indicator and pH meter.	
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.	

6. 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.

7. 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.

8. 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

9. 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

10. 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

11. 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	-	-	-	-	-	-	-

12. 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- WORKSHOP PRACTICE

COURSE CODE:-6G202

Diploma Programme in which this course is offered	**Semester in which offered**
CE/ME/AE/EE/**E&TC**/IT/CO	**SECOND**

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**
L	**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)

4	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	General Workshop Practice					
II	Fitting					
III	Plumbing					
IV	Metal Joining					
V	Furniture Making					
VI	Sheet Metal					
	Total					

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, mallet, chisels, plans, squares,	II
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	IV

	holder	
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, reamers, tap set, die set.	III
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, shearssheet 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	PO9	PO 10	PSO1	PSO2
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- ELECTRICAL TECHNOLOGY

COURSE CODE 6X202

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	**Semester in which offered**
Electronics & Telecommunication Engineering	**SECOND**

1. RATIONALE

Use of basics of electrical engineering principles, occurs in different occupations. It is Therefore necessary for diploma engineering students of almost all the branches to know some of the fundamentals of electrical engineering concepts. Therefore, this course has been designed to take care of this need.

2. COMPETENCY

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

Appraise basic concept and implement it to solve basic circuit problems using circuit laws.

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)	150
4	-	2	6	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

4. COURSE OUTCOMES

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

i. Calculate voltage and current in the given resistive circuits using KCL and KVL.
ii. Calculate electricity bill & equivalent capacitance in electrical circuits.
iii. Apply Faraday's law, Lenz's law, Fleming's right hand rule.
iv. Highlight difference between Statically and dynamically induced EMF.
v. Derive the current & voltage relationship in star - delta connections.
vi. Select a motor according to application.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit –I Fundamentals	1a. Understand the various electrical parameters 1b Identify the commonly used components in electrical engineering 1c Understand the terms work, Power and energy 1d Calculate voltage and current in the given resistive circuits using KCL and KVL 1e Calculate electricity bill 1f Calculate the equivalent capacitance in electrical circuits	1.1 Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. 1.2 Laws of resistance, resistivity, effect of temperature on resistance, RTC (simple numerical) Types of resistance and their applications. 1.3 Concept of AC and DC 1.4 Ohms law: applications and limitations. Series and parallel combination of resistance, current division rule, voltage and current source, ideal and practical (simple numerical) Definitions of node, branch, loop, mesh. Kirchhoff's laws (simple numerical).] Specifications of commonly used electrical appliances, calculation of electricity bill. (simple numerical).

Unit– II **Magnetism & Electromagnetic Induction**	2a. Understand the terms related to magnetism 2b. Select a material having lowest hysteresis loss 2c. Understand phenomenon of electromagnetic induction 2d. Apply Faraday's law, Lenz's law, Fleming's right hand rule, Fleming's left hand rule 2e. Differentiate between Statically and dynamically induced EMF, self and mutual inductance	2.1 Flux, flux density, magnetic field strength, mmf, reluctance, permeability 2.2 Comparison between electric and magnetic circuits. 2.3 Magnetization curve, magnetic hysteresis, hysteresis loop, hysteresis loss and methods to minimize it. 2.4 Faraday's laws of electromagnetic induction, Lenz's law, Fleming's right hand rule for Generators, Fleming's left hand rule for Motors. 2.5 Statically and dynamically induced EMF. 2.6 Self and Mutual inductance.
Unit– III **AC Fundamentals**	3a. Explain generation of alternating EMF 3b. Understand various Electrical parameters 3c. Derive equation for RMS and average value of sinusoidal wave 3d. Derive the current and voltage relationship in star and delta connections	3.1 Principle of generating an alternating voltage 3.2 Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S value, Form factor, Peak Factor and Power Factor. (simple numerical) 3.3 Vector representation of emf and current. 3.4 Mathematical representation of an Alternating emf and current 3.5 A.C. through pure a) resistors, b) Inductors and c) capacitors 3.6 A.C. through R-L series, R-C series, and R-L-C series & parallel circuit 3.7 Power in A. C. Circuits. Concept of power Triangle (simple numerical) 3.8 Advantages of three phase over single phase, phase sequence. 3.9 Voltage and Current relationship in Star and Delta connections. (No numerical)
Unit– IV **Transformer**	4a. Explain the construction and working of a single	4.1 Construction and working of transformer, classification , brief

	phase transformer 4b. Describe working Principle of Auto transformer 4c. Calculate transformer Performance parameters 4d. Select suitable type of transformer for a circuit	description of each part, its function :(power transformer, audio frequency transformer, radio frequency transformer, isolating transformer, pulse transformer, intermediate frequency transformer) 4.2 Significance of EMF equation (no derivation) Voltage ratio, current ratio and transformation ratio (simple numerical) 4.3 Various losses in transformers. 4.4 Autotransformers.
UNIT – V Electrical Machines	5a. Describe the construction of a typical three phase induction motor 5b. Explain working principle of single phase induction motors 5c. Select a motor according to application	5.1 D.C. Machines: Construction, types, principle of working and applications. 5.2 Three phase induction motor: Construction, types, principle of working and applications 5.3 Single phase Induction motors: Construction, Types, principle of operation and applications. 5.4 Universal motor: Construction, principle of operation and applications. 5.5 Stepper motor: Construction, types, principle of working and applications. 5.6 Servo motor: Construction, types, principle of working and applications.
UNIT – VI Electrical Power System	6a. Identify different stages of power system. 6b. Understand electricity transmission and distribution.	6.1 Single line diagram of electrical power system showing voltage level 6.2 Generation: energy sources, conventional and non- conventional, types of generating stations. 6.2 Transmission: classification on the basis of voltage Level, length and supply voltage. 6.3 Distribution: primary and secondary, voltage level and number of conductor, different types of load connected to distribution system.

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	14	06	05	06	17
2	Magnetism & Electromagnetic Induction	12	04	06	04	14
3	AC Fundamentals	13	03	06	07	16
4	Transformer	06	02	02	04	08
5	Electrical machines	13	05	05	07	17
6	Electrical power system	06	03	03	02	08
	Total	**64**	23	27	30	80

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

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1.	I	A) Observe your electrical laboratory & draw its layout, list the major equipments 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.	06
2.	I	Make a simple circuit using rheostat, ammeter, voltmeter & wattmeter and to measure different electrical quantities and	02

		verify ohms law.	
3.	I	Regulate current and divide potential by using rheostat	02
4.	I	Measure current in a particular branch of the given electrical circuit using Kirchoff's Current Law.	02
5.	I	Measure voltage drop in a closed loop of the given electrical circuit using Kirchoff's Voltage Law.	02
6.	I	Make a switch board using indicator, fuse, switches, plug pin socket and regulator. Then operate lamp and fan load.	04
7.	II	Plot B-H curve for given magnetic material.	02
8.	III	Use CRO to measure peak value, RMS value, Period and frequency of alternating quantity.	02
9.	III	Calculate power factor of R-L series circuit, and draw phasor diagram	02
10.	III	Verify the relationship between line and phase values of voltages and currents in three phase balanced star and delta connected load.	02
11.	IV	Calculate transformation ratio of given transformer.	02
12.	V	Starting and reversing of three phase induction motor.	02
13.	V	Starting and reversing of DC shunt /series motor Micro-Projects: : [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. Presentation of various methods of Testing of Transformers 2. Prepare a Switchboard of given specifications 3. Use LCR-Q Meter to find power factor of a R-L –C circuit 4. Install an Electric meter and show the units consumed for various loads 5. Report on Hydro/ Wind/ Solar/Thermal Electric Power System	02

Total	32

Note: 1st TO 11th Practicals are compulsory.

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1. Identify and select various measuring instruments as per required range.
2. Identify and select resistors based on color code.
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. Collect data of any generating station.
7. Assignments on solving numerical.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Arrange visit to power station / Generating plant.
2. Motivate students to observe different types of electrical loads around them.

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1	Electrical Technology Vol-1	Theraja, B. L.	S. Chand & Co. Ltd., 2011 or latest edition
2	Basic Electrical Engineering	Mittle,V.N.	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

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1	Motor – Generator Set	
2	AC / DC Motors	
3	Ammeters, Voltmeters, Wattmeters, Rheostats	0-5A, 0-150/300V

12. LEARNING WEBSITE & SOFTWARE

1 www.allaboutcircuits.com/vol_1/chpt_ml
2 http://openbookproject.net/electricCircml
3 www.kpsec.freeuk.com
4 www.howstuffwork/
5 www.nptel/electrical.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
CO1	Calculate voltage and current in the given resistive circuits using KCL and KVL.	3	3	2	1	1							
CO2	Calculate electricity bill & equivalent capacitance in electrical circuits.	3	3	2									

CO3	Apply Faraday's law, Lenz's law, Fleming's right hand rule	3	3	3									
CO4	Highlight difference between Statically and dynamically induced EMF.	1	1	1	1	1							
CO5	Derive the current & voltage relationship in star - delta connections.	2	2	2	2	2							
CO6	Select a motor according to application.	1	1	1	1	1							
	Total Strength	3	3	2	1	1							

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	Shri. M. D. Kharad	Lecturer in Electrical Engineering, Govt. Polytechnic, Aurangabad
2	Dr. S. D. Yardi	Lecturer in Electronics and Telecommunication Engineering, Govt. Polytechnic,Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE: PROGRAMMING LANGUAGE

COURSE CODE: 6X203

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	**Semester in which offered**
ELECTRONICS AND TELECOMMUNICATION ENGINEERING	**SECOND**

1. RATIONALE

C forms the basics of C++, Visual C / C++ etc. which is current requirement in the fields of computer science (CS) and information technology (IT).It combines features of both the high level and low level language. C is used for creating computer applications that are used in writing embedded software/ firmware for various micro-controller based products in electronics, communications and in industry. It is widely used to develop system programming & operating systems. C is also used in developing simulators, verification software and test code for various applications and hardware products. It is therefore vital for electronic engineers to develop interest and skill in C language.

2. COMPETENCY

"**Develop programs in 'C' language."**

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)	150
2	-	4	6	80	20	25	25	
Duration of the Examination (Hrs)				3	1	2	--	

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

- **I.** Distinguish between various data types.
- **II.** Develop programming logic for given problem.
- **III.** Implement looping in programs.
- **IV.** Create own functions and use library functions.
- **V.** Highlight effectiveness of Arrays, Structures and Pointers for data access.

VI. Develop projects using file management.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I Concepts, Constants, Variables and Data Types	1a. Prepare flowcharts 1b. Develop algorithms. 1c. Describe concept of constants and variables 1d. Distinguish between various data types	1.1 Concepts of programming methodology : Flowchart Algorithm 1.2 Character set 1.3 ‘ C’ tokens 1.4 Keywords , Identifiers 1.5 Constants & Variables 1.6 Declaration of variables 1.7 Assigning values to variables 1.8 Data types 1.9 Storage class
Unit - II Operators and Expressions	2a. Create arithmetic and logical expressions 2b. Use input and output Functions 2c. Develop programming logic for given problem	2.1 Assignment operators 2.2 Relational operators 2.3 Logical operators. 2.4 Arithmetic operators 2.5 Conditional operators 2.6 Increment and Decrement operator 2.7 Bitwise operators and special operators 2.8 Evaluation of arithmetic and logical expressions 2.9 Formatted input & output 2.10 I/O functions : scanf(), printf(), getch(), putch(), gets(), puts() 2.11 Programming exercises based on 2.12 arithmetic and logical expressions
Unit - III Branching and Looping	3a. Develop decision making Programming routines. 3b. Implement looping in programs	3.1 GO TO statement 3.2 IF statement. 3.3 IF…. else statement 3.4 Nested ‘IF… else ’statement. 3.5 Else if ladder routine 3.6 SWITCH statement 3.7 The ? : Operator. 3.8 Programming based on decision Making.

		3.9 FOR statement 3.10 WHILE statement 3.11 DO & DO… WHILE statements 3.12 Jumps in loops 3.13 Need of BREAK , CONTINUE statements in looping 3.14 Looping exercises in complex programming problems
Unit - IV ARRAYs and Pointers	4a. Handle large volume of data of similar type. 4b. Use array, structures & pointers to relate it to real world data types	4.1 Introduction to ARRAYs and Strings 4.2 One dimensional , two dimensional arrays of integer, float and characters 4.3 String related functions: strcat(), strcpy(), strlen(), strcmp(), strchr(), srstr(). 4.4 programming exercises based on Arrays 4.5 Introduction to Pointers 4.6 Initialization and declaration of Pointers 4.7 Programming exercises based on Pointer 4.8 Introduction to Structures
Unit - V User defined and library functions	5a. Understand the importance of User Defined Functions [UDF] 5b. Develop own functions and select suitable library functions for a programming logic	5.1 Introduction to User Defined Functions [UDF] 5.2 Call by reference and call by value 5.3 Library Functions: clrscr(), abs(), sqrt(), isdigit(), isalpha(), toupper(), tolower(), strlen(), strcat(), strcpy, strcmp 5.4 Difference between library functions and UDF. 5.5 Recursive function (ex. factorial) 5.6 Programming exercises based on Functions
Unit – VI File Management	6a. Describe file operations 6b. Operate files in given projects	6.1 Introduction of file management. 6.2 Opening, closing, defining a file viz.: fopen(), fclose(), fscanf(), fprintf(), fseek(), rewind(), ftell(). 6.3 Input and output operations on files.

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	Concepts , Constants, Variables and Data Types	6	06	06	00	12
2	Operators and Expressions	6	02	10	04	16
3	Branching and Looping	6	04	06	06	16
4	ARRAYs and Pointers	4	02	02	08	12
5	User defined and library functions	6	00	04	12	16
6	File Management	4	00	02	06	08
	Total	**32**	**14**	**30**	**36**	**80**

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.	I	Use the C complier software for editing, compiling and running programs. Use menu options and initialize local variables. Output and Input data using printf(), scanf() statement.	06
2.	II	Perform simple arithmetic programs using floating point Output and input data in proper format using printf(), scanf() Develop & test programs using conditional, relational or logical operators Develop programming logic for addition of digits of a 4 digit number	14
3.	III	Develop & test programs using control structures like: if , if…else , nested if…else, else ..if ladder Develop & test programs using switch , break ,continue statements Develop & test programs with while , do… while , for loops	12

4.	IV	Develop & test programs to declare & initialize arrays Develop & test programs using character type arrays Develop & test programs with pointer variables Develop logic to implement loops for arranging 10 numbers in ascending order	12
5.	V	Develop & test programs using library functions of C Develop & test programs with user defined functions of C Create a program to pass the value of local variables into user defined C functions	10
6.	VI	Create , read ,write an integer , character file **Micro-projects**: [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. Digital Clock using 'C' 2. String manipulations 3. Simple Calculators 4. Graphics using characters 5. Student Result Analysis 6. Matrix Operations Basic Mathematic Functions	10
Total			64

8. SUGGESTED STUDENTS ACTIVITIES

1. Prepare journals based on practical performed in laboratory.
2. Solve logical problems using different software tools.
3. Simulate programs for various applications & debug.
4. Develop mini project.
5. Identify use of 'C' programming in embedded systems applications.
6. Multiple choice questions ,short questions and answers.
7. Rapid code development.
8. Technical quiz, debate & seminar.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Arrange guided visits to automation industries.
2. Motivate students to use internet for applications of C, C++ programming.
3. Students may be helped to develop logic on individual basis
4. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Let Us C	Kanetkar Yashvant (Twelfth Edition)	BPB Publications, 2012
2.	Introduction to C Programming (With CD ROM support)	Reema Thareja (First Edition)	Oxford University Press, 2012
3	Programming in C	Balagurusamy, E (Fifth Edition)	Tata McGraw-Hill, New Delhi, 2012
4	Programming in C	Kernighan Brian and Ritchie Dennis (Second Edition)	Prentice Hall of India Pvt. Ltd., New Delhi, 2012

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Sr. No.	Name of equipment	Brief specification
1.	Personal Computers	32.bit
2.	Turbo C/ C++ Compiler	
3.	Multimedia projector, Tutorial Video CD (Programming in C), Expert video lectures.	

12. LEARNING WEBSITE & SOFTWARE

1. Software/tools : Turbo C or Borland C, Visual Studio
2. Theory and programming concepts: www.nptel.iitm.ac.in
3. http://www2.its.strath.ac.uk/courses/c/
4. http://www.iu.hio.no/~mark/CTutorial/C-Tut-4.02.pdf
5. www.nptelvideos.com/programming/c_programming_videos.php
6. www.ocw.mit.edu (Practical Programming in C - MIT Open Course Ware)
7. www.cprogramming.com

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

SNo	Course Outcome	POs										PSOs		No. of hours allocated in curriculum
		1	2	3	4	5	6	7	8	9	10	01	02	
CO1	Distinguish between various data types.	3	2	0										6
CO2	Develop programming logic for given problem.	3	3	2								2		6
CO3	Implement looping in programs.	3		3								3		6
CO4	Create own functions and use library functions	3		3								1		4
CO5	Highlight effectiveness of Arrays, Structures and Pointers for data access.	3		3								3		6
CO6	Develop projects using file management.	2		2		1						2		4
	TOTAL STRENGTH	3	1	2		0						2		32

Course Curriculum Design Committee

Dr. S. D. Yardi, Lecturer in Electronics and telecommunication, Government Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member

COURSE TITLE : COMMUNICATION SKILLS

COURSE CODE : 6G302

Diploma Programme in which this course is offered	Semester in which offered
All Branches of Diploma in Engineering and Technology	Second Semester

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	4.1.Non-verbal codes 4.2.Aspects of body language 4.3. Pictorial representation

	language. 4c. Uses of pictorial representations.	
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- resources 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	PO1	PSO	PSO	PSO
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 : ENVIRONMENTAL SCIENCE

COURSE CODE : 6G304

DIPLOMA PROGRAMME IN WHICH THIS COURSE IS OFFERED	SEMESTER
ME, CE, EE, E&TC, CO, IT, AE	SECOND

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**- Credits; **ESE**- End Semester Examination; **PT** – Progressive Test, **PA**- Progressive Assessment, PR- Practical Examination, OR – Oral Examination, TW - Term Work, # External, @ Internal examination , ~ Online Examination.

4. COURSE OUTCOMES :

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

1. Analyze and assess the impact of biodiversity and its loss on environment
2. Identify causes of pollution in working system and apply control measures for prevention.
3. Apply provisions of various environmental protection acts in practice.

4. Appreciate correlation between Human population and its effect on environment.
5. Read, analyze and apply various laws and regulations concerning environmental issues.

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 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	4	NA	NA	NA	NA
II	Environmental Natural resources	4	NA	NA	NA	NA
III	Ecosystems	4	NA	NA	NA	NA
IV	Biodiversity and conservation	4	NA	NA	NA	NA
V	Environmental Pollution	8	NA	NA	NA	NA
VI	Social issues and environment	4	NA	NA	NA	NA
VII	Human population and environment	4	NA	NA	NA	NA
Total		32	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 biodiversity. Write a report describing your observations and your recommendations for conservation of biodiversity.	04
9	V	Prepare a report on water pollution scenario in your institute and make a detailed report. Following activities can be	06

		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.	
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.

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	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 measures for prevention.					2	2						
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)

GOVERNMENT POLYTECHNIC, AURANGABAD

(An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre (6th Revision : Outcome Based Education - 2017-18)

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING

Third Semester Courses

Sr. No.	SEM	Course code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)								Remarks
				Theory (TH)	Practical (PR)	Tutorial (TU)	Total Credit (C)	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Practical Exam Hours	
1	III	6X204	Electronic Devices and Circuits –I	4	2	_	6	20	80	25#	--	25	150	3	2	
2	III	6X205	Digital Electronics	4	2	_	6	20	80	25@	--	25	150	3	2	
3	III	6X206	Circuits & Networks	4	2	_	6	20	80	25#	--	25	150	3	2	
4	III	6X208	Professional Practice	0	2	_	2	--	--	--	--	25	25	0	--	
5	III	6X209	Electronic Measurement and Instruments	3	2	_	5	20	80	25 @	--	25	150	3	2	
6	III	6X403	Electronics Communication-I	4	2	_	6	20	80	25#	--	25	150	3	2	
7	III		Non-Exam	0	2	_	2	--	--	--	--	--	--	NIL	NIL	

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

HOD Electronics and Telecomm Engineering

Govt. Polytechnic, Aurangabad.

COURSE TITLE : ELECTRONIC DEVICES & CIRCUITS -I
COURSE CODE : 6X204

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGG.	THIRD

1. RATIONALE

This course will enable students to develop the skills required to use basic electronic devices in various electronic circuits. Through the study of this course the students will understand the construction, working, characteristics and applications of various types of semiconductor devices such as Diodes and transistors, which are basic building block of amplifier, oscillator, switching circuit, wave shaping circuit and power supply. The knowledge of this core subject is essential for comprehending the courses that will be introduced later in the diploma program as well as developing requisite skills for effective functioning in the industry.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

"To construct and test analog circuits consisting of Active & Passive components"

3. TEACHING AND EXAMNATION 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	
4	0	2	06	80	20	25	25	150

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

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Students will be able to

1. Summarize the working of semiconductor devices.
2. Measure and calculate parameters of Semiconductor devices
3. Draw conclusion on VI characteristics of different semiconductor devices.
4. Compare characteristics of different semiconductor devices
5. Calculate efficiency of different types of Rectifier.
6. Plot frequency response curve of different amplifiers.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Semiconductor & special purpose Diodes**	1a Distinguish between intrinsic and extrinsic semiconductor materials. 1b Describe working, characteristic and applications of Diode, Zener Diode, LED, Photo Diode, LDR, Photovoltaic cell, varactor Diode, Point contact Diode. 1c Comparison of Diodes.	1.1 Intrinsic and extrinsic semiconductor materials: P type N type semiconductors PN junction, formation of depletion layer in PN junction, barrier voltage. 1.2 P-N junction Diode: biasing the PN junction, forward bias, reverse bias, VI characteristics, parameters of Diode, Diode current equation. 1.3 Zener Diode: Forward/ reverse characteristics, zener breakdown and avalanche breakdown, specifications. Equivalent circuit, Zener Diode as regulator. [Simple numericals based on above.] 1.4 Construction, working principle &

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		VI characteristics of special purpose Diodes: LED, Photo Diode, LDR, Photovoltaic cell, varactor Diode, Point contact Diode.
Unit –II **Rectifiers & Filters**	1a Differentiate the working of half and full wave rectifier. 1b Justify the need for different types of filters. 1c Differentiate between C, L, LC and π filters.	2.1 Block diagram of Power supply 2.2 Diode as rectifier, half wave, and center tapped full wave and bridge rectifier. 2.3 Derivation of average value of output voltage & load current in HWR, FWR. 2.4 Ripple factor, PIV, efficiency, TUF, comparison of rectifiers. 2.5 Need of Filters, Definition, types. 2.6 C,L,LC, π filters, Bleeder resistance 2.7 Simple numerical based on above.
Unit –III **Transistor**	3a Compare working of CB, CE and CC configurations. 3b Calculate parameters of CB, CE, CC transistor amplifier. 3c Explain the need for Darlington Pair. 3d Describe application of transistor as a Relay Driver. 3e Explain Transistor Characteristics.	3.1 Introduction to Transistor, Construction, Symbol, unbiased Transistor. 3.2 Transistor operation both PNP& NPN. 3.3 Operating regions of transistor: active, saturation and cut-off. 3.4 Transistor configuration: CB, CE, CC. 3.5 Transistor I/O characteristics in CE, CB,CC configuration . 3.6 Comparison of CB,CE and CC configuration. 3.7 Relation between Alpha , Beta and Gamma.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		3.8 Darlington Pair and its application 3.9 Transistor as switch. 3.10 Transistor used as a Relay Driver.
Unit-IV **Transistor Biasing Circuits and Thermal Stability**	4.1 Test different biasing circuits. 4.2 Define thermal instability and its adverse effect on working of any circuit.	4.1 Biasing; Need of biasing, DC load line, Selection of Q point, Factors affecting stability of Q point. 4.2 Biasing Circuits: Fixed Bias, Collector to Base bias, and Voltage divider bias, Comparison of Biasing circuits. 4.3 Thermal instability, Thermal Runaway and Stability Factor .
Unit - V **Transistor Amplifier**	5.1. Define amplifier parameters: gain, Bandwidth and Gain – bandwidth product. 5.2 Determine frequency response of CE amplifier using different types of coupling. 5.3 Describe the various types of couplings of amplifier.	5.1 Block diagram of an amplifier, amplifier characteristics- Av, Ai, Ri, Ro, Ap, Classification of amplifiers. 5.2 Transistor as an amplifier, single stage RC coupled amplifier, frequency response and bandwidth of RC coupled amplifier. 5.3 Multi stage amplifier: RC coupled Transformer coupled and Direct coupled amplifiers. 5.4 Comparison of amplifiers.
Unit - VI **Hybrid Parameters**	6.1 .Describe importance of h-parameters of the two port network 6.2. Analyze CE amplifier using h-parameters.	6.1 Two port network ,h-parameters and its equivalent circuits. 6.2 h-parameters for CE amplifier. 6.3 CE Amplifier parameters- Av, Ai, Ap, Ro, Ri using h- parameters.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**Semiconductor Diodes.**	10	06	04	04	14
II	**Rectifier & Filters.**	10	06	04	04	14
III	**Transistor.**	12	08	08	04	20
IV	**Transistor Biasing Circuits & Thermal Stability.**	12	06	02	04	12
V	**Transistor Amplifier.**	10	02	04	06	12
VI	**Hybrid Parameters.**	10	02	02	04	**08**
	Total.	**64**	**30**	**24**	**26**	**80**

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Plot the V-I Characteristic of PN Junction Diode.	2
2		Plot the V-I Characteristic of Zener Diode.	2
3		Plot the V-I Characteristic of Photo Diode.	2
4		Plot the V-I Characteristic of Light emitting Diode.	2
5		Plot the V-I Characteristic of LDR.	2
6		Plot the V-I Characteristic of Varactor Diode	2
7	II	Test half wave rectifier using CRO and measure PIV of Diode	2
8		Test full wave rectifier using CRO and measure PIV of Diode.	2
9		Test full wave bridge rectifier with C- filter using CRO.	2

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
10		Test full wave bridge rectifier with LC- filter using CRO	2
11	III	Plot input and output characteristics of transistor in CB configuration.	2
12		Plot input and output characteristics of transistor in CE configuration.	2
13		Plot input and output characteristics of transistor in CC configuration.	
14		Build amplifier using Darlington pair and calculate its gain.	2
15	IV	Build and test voltage divider biased type amplifier & measure voltage at different points on the circuit and observe waveforms.	2
16	V	Obtain frequency response of single stage transistor amplifier.	2
17		Obtain frequency response of Single stage RC-coupled amplifier.	2
18		Obtain frequency response of Two stage RC-coupled amplifier.	2
19	VI	Calculate h-parameters of given transistor amplifier.	2

[Note : Any 10 practicals from above list]

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1. Visit portals of **Electronic Devices & Circuits**.
2. Find Specifications and package of Diode, Transistor, etc.
3. Prepare chart for characteristic of various electronics components.
4. Assignments on solving numerical.
5. Survey to collect data sheets for various electronics components used in different circuits.
6. Mini projects: Build circuit/mini project using electronic components.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Students should be shown animations/video films to explain the working concept of different types of Diodes, transistors, ICs, amplifiers, oscillators, regulated power supply etc.
2. Samples of the electronic components and devices should be brought in the class for demonstration while teaching those components and devices
3. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Applied Electronics	R .S . Sedha	S Chand & Company
2	Electronic Devices and Circuit Theory	Boylestad Robert	Pearson, 2007 or latest
3	Electronic Devices and Circuits	Bell David A	Oxford University Press.
4	Electronic devices and Circuits	Millman Halkias	MGH New Delhi latest edition
5	Basic Electronics and Linear Circuits	Bhargava, N.,Kulshreshtha D., S.Gupta	Tata McGraw- Hill Education, 2011
6	Electronics Devices and Circuits	Mottershead, Allen	PHI Learning,2011

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

i. Function Generator

ii. Multimeter

iii. D.C. Power Supply

iv. Variac

v. Cathode Ray Oscilloscope

vi. Digital Storage Oscilloscope

vii. Experimental Trainer Kits, Bread Board, General Purpose PCB and Electronics Work bench

11. LEARNING WEBSITE & SOFTWARE

1. www.nptel.iitm.ac.in
2. www.youtube.com. (lectures on Basic electronics)
3. www.howstuffworks.com
4. www.alldatasheet.com

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	PSO3	No. of hours allocated in curriculum
CO1	Explain the working of semiconductor devices.	2	2	2	2										14
CO2	To measure and calculate parameters of Semiconductor devices	2	3	1	2										14
CO3	To draw VI characteristics of different semiconductor devices	2	3	2	2										20
CO4	Compare characteristics of different semiconductor devices	3	3	3	1										12
CO5	To calculate efficiency of different types of Rectifier.	0	3	3	0										12
CO6	To plot frequency response curve of different amplifiers.	1	3	2	2										08

Course Curriculum Design Committee :

1. S.D NIMBEKAR Lecturer , Department of Electronics and Telecommunication Engineering , Government Polytechnic , Aurangabad.
2. V.G.MAHENDRA Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE : DIGITAL ELECTRONICS
COURSE CODE : 6X205
PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	THIRD

1. RATIONALE

Digital electronics plays significant role in revolution of Electronics industries. The major focus of the course is to expose students to design process of combinational and sequential logic circuits .This course gives profile to work in hardware industries, process industries. It gives strong foundation to all modern electronics devices and digital systems.

2. COMPETENCY

Develop various sequential and combinational logic circuits.

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3. TEACHING AND EXAMNATION 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) @(Internal)	PA	
4	0	2	6	80	20	25	25	150
Examination Duration in Hrs				3	1	2		

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 Examiner

4. COURSE OUTCOMES

I Convert numbers from one numbering system to other.
II Deduce Boolean expressions for modeling a situation.
III Simplify Boolean expressions using K-map.
IV Design and implement MUX, DEMUX, Encoder, Decoder, MOD-N Counter.
V Analyze operation of MOD – N counter from its circuit diagram, truth table and waveforms.

VI Select ICs of typical logic families to suit the application.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
UNIT-I **Number Systems & Binary Codes**	1a. Perform arithmetic operations on Binary numbers 1b. Subtract given binary numbers using 1's and 2's complement method 1c. Subtract given decimal number using 9's and 10's compliment 1d. Convert the given number from one number system to another. 1f. Interpret binary codes 1g. Convert codes	1.1 Number systems: Decimal, Binary, Octal and Hexadecimal. 1.2 Binary arithmetic operations: Addition, subtraction, multiplication and division. Subtraction by 1's and 2's complement method 1.3 Subtraction using 9's and 10's complement method 1.4 Conversion between Decimal, Binary, Octal, Hexadecimal number systems 1.5 BCD, Excess -3, Gray, Parity ASCII, EBCDIC codes
UNIT-II **Boolean Algebra & logic Gates**	2a. Verify truth tables of Logic gates 2b. Simplify the Boolean functions. 2c. State and verify theorems of Boolean algebra. 2d. State and verify De-Morgan's theorem 2c. Implement the Boolean function or Boolean expressions for modeling a situation using logic gates 2d. Simplify Boolean expression using K-map. 2e. Realize logic circuits of the simplified expression using logic	2.1 Basic Digital Logic Gates: Symbol operation and truth-table of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates. 2.2 Basic laws, theorems and properties of Boolean algebra. De- Morgan's Theorem 2.3 Boolean functions: Sum of Product (SOP) and Product of Sum (POS) expressions. Simplification of logical expressions. 2.4 Karnaugh map method for simplification of Boolean expression.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	gates.	
UNIT-III **Combinational Logic Circuits**	3a. Specify need of combinational logic circuits. 3b. Test the logic circuits with truth table. 3c. Design and implement MUX, DEMUX. 3d. Design and implement Encoder, Decoder. 3e. Design Code converters parity generators and comparator	3.1 Combinational Circuits: Half adder, full adder, parallel binary adder, half Subtractor , full subtractor, 1's complement subtractor, 2's complement subtractor/adder BCD adder using logic gates / ICs 3.2 Multiplexer and Demultiplexer: MUX (4:1), (8:1),DEMUX (1:4), (1:8) 3.3 Encoder and Decoder: Octal to Binary Encoder (8:3), Decoder (3:8), BCD to 7-segment Decoder 3.4 Gray to Binary , Binary to Gray Converter, Parity generator, 2-bit Magnitude Comparator
UNIT– IV **Sequential Logic Circuits**	4a. Highlight terms related to sequential logic circuits 4b. Compare combinational and sequential logic circuits. 4c. Illustrate operation of a flip-flop with its truth table. 4d. Design clocked flip-flops using S-R flip-flops. 4f. Illustrate with neat sketches operation of Data transfer/ shift in USR. 4g. List applications of shift register. 4h. Design MOD-5, Mod-9 Counter. 4i. Distinguish between 4-bit ripple counter,	4.1 Digital clock signal, duty cycle, synchronous and asynchronous circuit operations, Edge and Level triggered operations. 4.2 Flip-flops: S-R, J-K, T, D, Master-Slave JK 4.3 Applications, Truth table, logic circuits of each flip-flop, Race around condition. 4.4 Shift register: Series , Parallel, shift, SISO, SIPO, PISO, PIPO. 4.5 Universal shift register [USR]. 4.6 Counters: Ripple/ asynchronous counter, Synchronous counter. 4.7 Mod-counter, Up-Down counter.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	synchronous decade counter and up-down counter.	
UNIT – V **D-to-A Converter, A-to-D Converter and Memory**	5a. Highlight important ADC, DAC parameters such as: resolution, linearity, accuracy, conversion time, step size. 5b. Explain principle of DAC. 5c. Outline working of DAC. 5d. Explain principle of ADC. 5e. Outline working of ADC. 5f. Classify memories on the basis of working principle, technology used for fabrication, mode of access, physical characteristics	5.1 D-to-A conversion [DAC]: Accuracy, resolution, weighted resister, R-2R ladder network. 5.2 A-to-D conversion [ADC]: Conversion time, Resolution, Dual slope integration, Successive approximation, Flash type ADC. 5.3 Semiconductor memory: ROM, PROM, EPROM, EEPROM, RAM –SRAM & DRAM, Flash memory
UNIT - VI **Digital Integrated Circuits**	6a. Highlight important characteristics of digital ICs 6b. Compare working of uni-Polar logic families. 6c. Explain working of bipolar logic families. 6d. Compare characteristics	6.1 Logic families , Integration levels: SSI, MSI, LSI, VLSI. 6.2 Characteristics of digital ICs: Current and voltage parameters, Fan-in, fan-out, propagation delay, noise margins, power dissipation, figure of merit. 6.3 Transistor –transistor logic [TTL] circuits: Open collector output,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	and circuits [AND/ NOR logic] of logic families.	Tri-state output, totem pole output. 6.4 Integrated Injection Logic [IIL]. 6.5 Emitter Coupled Logic [ECL]. 6.6 MOS, CMOS logic. . 6.7 Compare logic families.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Number Systems & Binary Codes	12	04	06	02	12
II	Boolean Algebra & logic Gates	12	02	06	06	14
III	Combinational Logic Circuits	10	04	05	05	14
IV	Sequential Logic Circuits	10	02	04	10	16
V	D-to-A Converter, A-to-D Converter and Memory	10	00	04	10	14
VI	Digital Integrated Circuits	10	02	05	03	10
	Total	**64**	**14**	**30**	**36**	**80**

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	Unit No.	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Approx. Hrs. required**
1.	II	Build and Test the functionality of Basic Logic Gates**.**	2
2.	II	Build and Test 2 input basic logic gates using NAND/ NOR gates.	2
3.	III	Build a circuit to Convert 4 bit Binary to Gray Code using logic gates OR Build a circuit to Convert 4 bit Gray to Binary Code using logic gates	2
4.	III	Build and Test Half Adder Circuit.	2
5.	III	Build and Test Full Adder Circuit.	2
6.	III	Build and Test Half Subtractor Circuit.	2
7.	III	Build and Test 4 bit Parallel Adder circuit.	2
8.	III	Build and Test the 3:8 Decoder circuit.	2
9.	III	Build and Test the 8:1Multiplexer circuit.	2
10.	III	Build and Test BCD to Seven segment LED Display circuit.	2
11.	IV	Build and Test the working of the SR Flip-Flop.	2
12.	IV	Build and Test the functionality of the JK Flip-Flop.	2
13.	IV	Build and Test the working of the Shift Register.	2
14.	IV	Build and Test the working of the 4 bit Ripple Counter.	2
15.	IV	Build and Test the working of 4 bit UP - DOWN Counter.	2
16.	V	Build and Test Analog/Digital converter (ADC 0809)	2
17.	V	Build and Test digital to analog converter (DAC 0808) **Micro-projects**: [Industry application, Field, Internet, Workshop, Laboratory based applications]	2

S. No.	Unit No.	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Approx. Hrs. required**
		1. Mm	
Total Hours			**32**

8. **SUGGESTED STUDENTS ACTIVITIES**

1. Solve simple logical problems.
2. Use DATA Sheet: to write specifications, power supply, voltage levels, pin diagram, applications of the digital ICs [Logic gates, MUX / DEMUX, Decoder, FF, Shift register, Counter, ADC/ DAC.].
4. Solve given problems using binary logic theory and implement it using digital logic circuits.
5. Explore working of Digital clock/ Digital panel.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Display Digital ICs, Components and materials to students in a special class.
2. Show mini projects with simple digital circuits, LEDs, buzzer, switches.
3. One Internet based home assignment.
4. Discuss designs of simple applications of digital circuits
5. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1.	Digital Principles and Application	Malvino and Leech	TMH Pub., New Delhi, 6th Edition or latest
2.	Modern Digital Electronics	Jain, R P	TMH Education, New Delhi, 3rd Edition or latest
3.	Digital Electronics	Kharate G.K.	OXFORD University Press 2010
4.	Digital Techniques	Godse, A.P.	Technical publications,
5.	Digital electronics: Principles, devices and applications	Maini, A .K.	John Willy and Sons, Latest edition

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

Sr.NO.	Name of the Equipment
1	D to A and A to D Converter Trainer Boards
2	Digital IC Tester,breadboards
3	Multimedia projector, Tutorial Video CD, Expert video lectures.

12. LEARNING WEBSITE & SOFTWARE

i. www.nptel.iitm.ac.in
ii. www.ocw.mit.edu
iii. www.slideshare.net/

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
CO1	Convert numbers from one numbering system to other.	3	3	3	1	1								12
CO2	Deduce Boolean expressions for modeling a situation.	3	3	3	1									06
CO3	Simplify Boolean expressions using K-map.	3	3	3	3	3								06
CO4	Design and implement MUX, DEMUX, Encoder, Decoder.		3	3	3	3							1	05
CO5	Analyze operation of counter from its circuit diagram, truth table / state diagram and waveforms.		3	3	3	3							1	05
CO6	Select ICs of typical logic families to suit the application.		3											10

Course Curriculum Design Committee

Sr No	**Name of the faculty members**	**Designation and Institute**
1	Dr. S. D. Yardi	Lecturer , Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad
2	Smt. V. G. Mahindra	Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad3:

(Member Secretary PBOS)

(Chairman PBOS)

COURSE TITLE- : CIRCUITS & NETWORKS

COURSE CODE : 6X206

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	**Semester in which offered**
ELECTRONICS & TELECOMMUNICATION ENGINEERING	THIRD

1. RATIONALE

Circuits & Network is a core area, the knowledge of which is essential for electronic engineering diploma holders and they need assimilate it in order succeed in the Industry. In this regard, the basic knowledge of various theorems, resonance, filtering and attenuation related passive electronic components is essential. Understanding of these concepts will be useful determine the various parameters required solve various problems and applications. This course has been designed achieve these aims

2. COMPETENCY

"Analyze electronic circuits & networks in terms of voltage, current, power, attenuation and frequency response"

3. TEACHING AND EXAMNATION 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)# (External)**	**PA**	**150**
4	0	2	6	80	20	25	25	
Examination Duration in Hrs				3	1	2		

Legends : L-Lecture**; T-**Turial/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 Examiner

4. COURSE OUTCOMES

1) Define, relate and summarize basic circuit elements.
2) Analyze & examine the circuits by KVL, KCL, Mesh, Node analysis.
3) Evaluate electrical parameters by different network theorems.
4) Analyze the two port network.
5) Analyze the behavior of series & parallel resonant circuits using frequency response curve & calculate resonance frequency.
6) Classify & design various passive filter circuits.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Basic Circuit Elements**	1a Differentiate between voltage source and current source. 1b Determine voltage, current and power relationship for resistors connected in series, parallel combination. 1c. Determine voltage, current and power relationship for capacitors connected in series, parallel combination. 1d. Analyze the circuit calculate voltage and current at various points in the circuit.	1.1 Voltage, Current, Power &Energy, Definitions of Active &Passive elements, Linear & Nonlinear elements, Lumped and distributed elements. 1.2 Circuit elements: Voltage source, current source, Resistance, Inductance, Capacitance. 1.3 Voltage, current and power relationship for resistors connected in series, parallel combination.
Unit– II **Network Analysis**	2a. Analyze the circuit calculate voltage and current in the given resistive circuits using KCL and KVL 2b. Analyze the resistive circuits calculate voltage and current using Mesh and nodal analysis method 2c. Transform voltage source in current source & vice versa of given circuit.	2.1 Kirchhoff's Laws: Voltage and current law 2.2 voltage division rule, current division rule. 2.3 Mesh analysis . 2.4 Nodal analysis . 2.5 Source transformation technique.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		(Numerical based on above for DC networks.)
Unit– III **Network Theorems**	3a. Find the dual of given network. 3b. Calculate the current in any branch of the circuit using Superposition Theorem. 3c. Calculate the V_{th}, R_{th} and load current in the circuit using Thevenin's Theorem. 3d. calculate the load current in the circuit using Norn's Theorem. 3e. Describe the Maximum Power Transfer condition for any given network. 3f. Verify the Reciprocity Theorem. 3g. Apply the Millman's Theorem for given network. 3h. Transform star delta & delta star network.	3.1 Superposition theorem. 3.2 Thevenin's theorem. 3.3 Nortan's theorem. 3.4 Maximum power transfer theorem. 3.5 Millman's theorem. 3.6 Reciprocity theorem. 3.7 Star delta transformation. 3.8 Duals & Duality. (Numerical based on above for DC networks.)
Unit– IV **Two port Network**	4a. Calculate Z- parameters for given two port network. 4b. Calculate Y- parameters for given two port network. 4c. Calculate ABCD- parameters for given two port network. 4d. Calculate h- parameters for given two port network. 4e. Convert the parameters.	4.1 Definition of two port network. 4.2 Z- parameters. 4.3 Y- parameters. 4.4 ABCD parameters. 4.5 h- parameters. 4.6 Conversion of parameters. (Numerical based on above)

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– V **Resonance**	5a. Determine Quality facr of a Coil and Capacitor. 5b. Analyze the behavior of Series and Parallel resonant circuit using frequency response curve 5c. Calculate resonance frequency and various parameters of Series and Parallel resonant circuit.	5.1 Series resonance-Impedance and phase angle of series resonance circuit, 5.2 voltage and current in series resonant circuit, selectivity and BW in series resonant circuit, 5.3 Q-factor of an Inductor. 5.4 Parallel Resonance - Resonant frequency for tank circuit, 5.5 Q-factor of parallel resonant circuit (Numerical based on above.)
Unit – VI **Filters and Attenuars**	6a. Classify the various passive filter circuit. 6b. Design various passive filter circuit. 6c. Derive relation between decibel and Neper. 6d. Derive the cut-off frequency equations for constant-k type, T and π sections of low Pass and High Pass filters. 6e. Classify various types of attenuator. 6f. Design various types of attenuator.	6.1 Filters - Classification of filters, Decibel & Neper. 6.2 Equations of filter network (T & π**)** 6.3 Constant K- Low pass & High pass filter. 6.4 Attenuators- T type & π type attenuators. 6.5 Lattice attenuators, Bridge T-attenuators. (Numerical based on above.)

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 Circuit Elements**	08	06	04	00	10
II	**Network Analysis**	10	02	06	04	12
III	**Network Theorems**	10	04	06	08	18
IV	**Two port Network**	12	02	04	06	12
V	**Resonance**	12	02	02	06	10
VI	**Filters and Attenuators**	12	02	02	14	18
		64	**18**	**24**	**38**	**80**

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

7. LIST OF PRACTICALS / LABORARY EXPERIENCES/ TURIALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1. Verify KVL and KCL.	04
2	II	1. Calculate unknown parameters of network using Mesh Analysis. 2. Calculate unknown parameters of network using Nodal Analysis.	04
3	III	1 Verify superposition theorem. 2 Verify Thevenin's theorem. 3 Verify Norton's theorem. 4 Verify Maximum power transfer theorem.	08
4	IV	1. Calculate Z parameters of given two port network. 2. Calculate Y parameters of given two port network. 3. Calculate A,B,C,D parameters of given two port network. 4. Calculate h parameters of given two port network.	08
5	V	1. Plot frequency response of series RLC circuit	

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		2. Plot frequency response of Parallel RLC circuit.	04
6	VI	1. Plot frequency response of Low pass filter 2. Plot frequency response of High pass filter	04
7		Micro Project. 1.	
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

1. Assemble circuits on bread board.
2. Mini projects: Build circuit/mini project using electronic components.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Students should be shown animations/video films to explain the different theorems.

ii. Tutorial hours should be used to develop the ability in students to solve the numerical problems related to theorems and circuits. It is must because only by solving the numerical they would develop the understanding of the theorems .Students must be classified in three groups i.e. academically weak students, average students and good students and they should be given problem according to their abilities in each unit. This would provide them a challenge which they can face without indulging in unfair means. Verify different theorems.

iii. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Circuit and Network	A. Sudhakar	Tata McGraw-Hill Education
2	Network Theory	D.Roy Chaudhary	New age international publication
3	Network Analysis	Van Valkenberg	Prentice-Hall Of India Pvt. Limited

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1) Signal generator
2) DC power supply
3) Digital/Analog multi-meter.
4) Bread board
5) Assorted R,L,C components.
6) Oscilloscope.
7) 4/8 Ω loud speaker.
8) Trainer kits.

12. LEARNING WEBSITE & SOFTWARE

1. www.nptel.iitm.ac.in
2. www.youtube.com. (lectures on Circuits & Networks.)

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
CO1	Define ,relate and summarize basic circuit elements.	2	3	1	-	-	-	-	-	-	-	-	-	8
CO2	Analyze & examine the circuits by KVL,KCL,Msh,Node analysis.	2	2	2	2	-	-	-	-	-	-	-	-	10
CO3	Experiment with the passive circuits & Evaluate electrical parameters by different network theorems.	2	2	2	2	-	-	-	-	-	-	-	-	10
CO4	Analyze the two port network.	2	2	2	2	-	-	-	-	-	-	-	-	12
CO5	Analyze the behavior of series & parallel resonant circuits using frequency response curve & calculate resonance frequency.	2	2	2	2	-	-	-	-	-	-	-	-	12
CO6	Classify & design various passive filter circuits.	2	2	2	2	-	-	-	-	-	-	-	-	12
COURSE		**3**	**3**	**2**	**2**	-	-	-	-	-	-	-	-	**64**

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	S.D.Sutawane,	Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- **PROFESSIONAL PRACTICES**

COURSE CODE **6X208**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS AND TELECOMMUNICATION ENGINEERING	THIRD

1. RATIONALE

Overall professional development of diploma in Electronics & Telecommunication engineering is the need of the day for enabling them to sustain in competitive global environment.

Professional development of Diploma engineering students is to be done by exposing them to various simulative situations in the industries. This can be achieved by inculcating attitude to face the problems, get alternative solutions and validation of the selected alternatives. This is achieved by involving students in activities such as inviting experts from various industries for sharing their experiences, arranging industrial visits, seminars etc.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types

of skills so that students are able to acquire following competency:

1. Write the reports on Industry Visits & Guest Lectures.

2. Deliver Seminars on a given topic which will help them to build self-confidence .

3. TEACHING AND EXAMNATION SCHEME

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

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

1.Acquire knowledge of contemporary issues and relate the advancements in Electronics & Communication engineering domain in a global, economic, environmental, and societal context.

2.Aware of Electronics & Telecommunication engineering professional practice issues and has an appreciation of the broader in global, societal, economic, and environmental aspects.

3.Analyze the current situations, discuss & disseminate about advancements in related profession including societal, environmental and ethical responsibilities of an engineer.

4.Develop individual confidence to handle various engineering assignments and expose themselves to acquire life skills to meet societal challenges.

5.Acquire life skills to meet societal challenges.

6.Enhance the employability skills and to increase his ability to engage in, life-long learning, Usage of modern tools by undergoing industrial visits.

5 .DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Information Search and Data collection**	1a. Acquire knowledge of contemporary issues 1b. Relate the advancements in Electronics & Communication engineering domain in a global, economic environmental, and societal context.	Information search can be done through manufacturer's catalogue, websites, magazines; books etc. Following topics are suggested: 1.1 3G & 4G mobile communications. 1.2 LTE (**Long-Term Evolution)** Technology 1.3 Blue-Ray Technology 1.4 E-waste disposal 1.5 Artificial Intelligence 1.6 Data Compression Techniques

		1.7 Ipod and Ipad 1.8 Biometric Systems 1.9 Free and Open Source Software's (FOSS) 1.10 Automotive Electronics 1.11 Quality Certification Standards 1.12 Pen PC
Unit –II **Documentation on Guest Lectures given by experts**	2a.Realize importance of Electronics &Telecommunica -tion engineering professional practice issues. 2b. Relate its effect on broad global, social, economic, Ethical and environmental aspects.	Time Experts / Professionals from different field/industries are invited to deliver lectures at least TWO sessions in a semester. The topics may be selected by the teacher /industry expert to develop required skills. 2.1 Pollution control. 2.2 E-Waste management. 2.3 Computer Networking and Security. 2.4 Career opportunities, 2.5 Safety Engineering and Waste elimination. 2.6 Interview Techniques. 2.7 Programmable logic controllers. 2.8 Cloud computing.
Unit-III **Group discussions Activity**	3a.Analyze the current situations. 3b. Disseminate about advancements in related profession including societal, environmental and ethical responsibilities of an engineer.	The students shall discuss in group of six students. Some of the suggested topics are: 3.1 Polythene bags must be banned! 3.2 E – Books or Printed books? 3.3 Global warming 3.4 Rain forests help in

		maintaining the earth's ecosystem 3.5 Water resources should be nationalized 3.6 Managers are born, not trained 3.7 Managerial skills learnt in the classroom 3.8 Mobile phones - requirement of the day. 3.9 Education is a progressive way of discovering your ignorance. 3.10 E-Learning is good for the education system and society
Unit – IV **Individual assignment/ Life skill activity**	4a. Develop individual confidence to handle various engineering assignments. 4b. Acquire life skills to meet societal challenges	The students will perform ANY ONE of the following activities individually or in a group (other similar activities may be considered) ***A. Individual assignments*** 4.1 Suggest individual activities or encourage students to take up desired activity. ***B. Life skills*** 4.2 Conduct aptitude, general knowledge test, IQ test, Solve Puzzles. 4.3 Set the goal for personal development. 4.4 Develop good habits to overcome stress.

Unit – V **Industrial Visit**	5a. Build the employability skills 5b. Develop his ability to engage in, life-long learning. 5c. Handle modern tools by undergoing industrial visits	5.1 Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.

5. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Marks			
			R Level	U Level	A Level	Total Marks
I	**Report on Information Search and Data collection**	08	--	--	--	05
II	**Document on Guest Lectures by experts**	06	--	--	--	05
III	**Group discussions Activity**	06	--	--	--	05
IV	**Report on Individual assignment/ Life skill activity**	06	--	--	--	05
V	**Report on Industrial visit**	06	--	--	--	05
VI	**TOTAL**	**32**	--	--	--	25

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Activity (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	**Information Search and Data collection**	08
2	**Documentation on Guest Lectures given by experts**	06
3	**Group discussions Activity in group**	06
4	**Individual assignment/ Life skill activity**	06
5	**Industrial visit (related industry)**	06
Total Practical Hours		32

7. SUGGESTED STUDENTS ACTIVITIES\

1.Collect articles from newspaper and magazines and read with correct pronunciation .

2.Listen to business news on radio and TV.

3.Under take micro projects.

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

1. Books on personality development & soft skills.
2. Engineering Subjects Reference books.
3. Journals & Magazines –IEEE journals, IT Technologies, PC Quest, Linux for You, CSI, Computer Today etc.

4. Local News Paper.
5. Books on General Knowledge, Aptitude Test, Puzzle Solving by – R .S. Agarwal,

9. **LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED** :-- Nil

10. LEARNING WEBSITE & SOFTWARE

1.1 www.youtube.com. (lectures on Professional Practices and ethics)
1.2 www.groupdiscussion.com
1.3 www. Seminarprojects.com

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
CO1	Acquire knowledge of contemporary issues and relate the advancements in Electronics & Communication engineering domain in a global, economic, environmental, and societal context.	0	3	0	0	3	0	0	3	0	3	0	0	**08**
CO2	Aware of Electronics & Telecommunication engineering professional practice issues and has an appreciation of the broader in global, societal, economic, Ethical and environmental aspects.	0	0	0	0	0	3	3	3	0	3	0	0	**06**
CO3	Analyze the current situations, discuss & disseminate about advancements in related profession including societal, environmental and ethical responsibilities of an engineer.	0	0	0	0	3	3	3	3	3	3	0	0	**06**
CO4	Develop individual confidence to handle various engineering assignments and expose themselves to acquire life skills to meet societal	0	0	0	0	0	0	0	3	3	3	0	0	**02**

	challenges													
CO5	Acquire life skills to meet societal challenges.								3	3	3			**04**
CO6	Enhance the employability skills and to increase his ability to engage in, life-long learning, Usage of modern tools by undergoing industrial visits	0	3	0	0	3	3	3	3	3	3	0	0	**06**
	Total Strength													**32**

Course Curriculum Design Committee

- Dr. R . G. Wadekar, HOD, Department of Electronics and Telecomm Engineering, Govt. Polytechnic, Aurangabad
- Dr. S. B. Dhoot, Department of Electronics and Telecomm Engineering, GPA

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE : ELECTRONIC MEASUREMENT AND INSTRUMENTS

COURSE CODE : 6X209

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	THIRD

1. RATIONALE

Instrumentation is an emerging field used in data detection, acquisition, analysis and control in industrial applications. Analog and digital instruments are mainly used to determine different process parameters. These instruments present the desired information in visual indication either in analog or digital form. This course presumes that the students are familiar with basic utilization of measuring instruments. This course imparts information about concepts, principles and procedures of analog and digital electronic measuring instruments and measuring techniques.

2. COMPETENCY

"Measure various Electrical parameters using appropriate instrument."

3. TEACHING AND EXAMNATION 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	
3	0	2	5	80	20	25	25	150
Exam Duration in Hours				3	1	2		

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 Examiner.

4. COURSE OUTCOMES

i. Recall the basic concepts of instruments.
ii. Measure various electrical parameters with accuracy, precision, resolution.
iii. Measure relevant parameters using AC and DC bridges .
iv. Operate front panel controls of CRO for appropriate measurements.

v. Experiment with Signal Generator, pulse generator for appropriate measurement.

vi. Select appropriate passive or active transducers for measurement of physical phenomenon.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Fundamental parameters**	1a. Define characteristics of instrument. 1b. Describe the types of error 1c. classify units and standards. 1d. Classify various instruments.	1.1 Classification of Instruments: Absolute, Secondary Instruments 1.2 Static characteristics of Instruments: Accuracy, Precision Sensitivity, Resolution, Reproducibility, Drift, linearity Dynamic Characteristics:Speed of response, Lag, fidelity,. 1.3 Types of Error- Gross, Systematic, Random. 1.4 Classification : Units of measurement 1.5 Standards: International Primary. Secondary.
Unit– II **AC & DC Measurement**	2a. Draw construction details of PMMC meter. 2.b List specifications of AC/DC meters. 2c. Operate analog and digital multimeter.	2.1 Working principle and construction of PMMC instruments 2.2 Analog DC voltmeter – series & shunt type. 2.3 Multirange voltmeter: Voltmeter sensitivity, loading effect. 2.4 Analog AC Voltmeter: Half Wave and Full wave rectifier type. 2.5 Analog AC Ammeter 2.6 Analog multimeter: circuit diagram and operation 2.7 Block diagram of Digital Multimeter.
Unit– III **Bridges**	3a. Calculate resistance of DC bridges. 3b. Relate working and application of AC bridges. 3c Measure components values using LCR –Q meter 3.d Compare and contrast bridges.	3.1 Principle and Working of DC bridges :Wheatstone's bridge, Kelvin's bridge, guarded Wheatstone's bridge. 3.2 Principle and Working of AC bridges : Maxwell's bridge, Hay's bridge, Schering's bridge. 3.3 LCR- Q meter : Block Diagram ,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		working and applications 3.4 Comparison of bridges [Numerical based on above.]
Unit– IV **Oscilloscopes**	4a. Understand the basic building blocks of CRO 4b. Highlight importance of deflection systems. 4c. Measure parameters: Amplitude, frequency and time period using CRO.	4.1 Block diagram of CRO. 4.2 Cathode ray tube: construction and Operation. 4.3 Deflection systems: Vertical deflection system, Horizontal deflection system, Delay line. 4.4 Front panel controls of CRO 4.5 Measurement of frequency, time delay, phase angle. 4.6 Multiple trace CRO. 4.7 Working principle of digital storage oscilloscope 4.8 Oscilloscope probes.
Unit – V **Signal generators**	5a. Explain working principle of signal generators. 5.b Operate front panel controls of AF and RF type signal generator. 5c. Operate front panel controls of function generator. 5c. Operate front panel controls of square and pulse generator. 5d. Operate front panel controls Video pattern generator	5.1 Signal generators : need 5.2 Block diagram, operation and applications :AF and RF type signal generator 5.3 Block diagram, operation and applications of Function generator 5.4 Block diagram, operation and application of Square and Pulse generator 5.5 Block diagram, operation and application of Video pattern generator.
Unit – VI **Transducers**	6a. Differentiate: active and passive, primary and secondary transducers. 6.b Measure physical quantities using transducers . 6.c Measure temperature using Thermocouple and Thermistor. 6.d Select appropriate transducer for measurement of physical quantity.	6.1 Classification and general characteristics of transducers. 6.2 Construction, Working and application of : Strain gauge, LVDT, Capacitive transducers, Piezoelectric transducers and Inductive transducers. 6.3 Temperature measurement : Thermocouples, Thermistors

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	**Fundamental parameters**	4	04	04	00	8
II	**AC & DC Measurement**	6	02	04	06	12
III	**Bridges**	10	02	06	08	16
IV	**Oscilloscopes**	08	04	08	04	16
V	**Signal generators**	10	04	08	04	16
VI	**Transducers**	10	02	04	06	12
	Total	**48**	**18**	**34**	**28**	**80**

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	a) List various standard sources & measuring units	02
2	II	a) Measure DC & AC voltages, current using ammeter and voltmeter. b) Test diodes and transistors using analog and digital Multimeter.	04
3	III	a) Determine the value of unknown resistance using wheatstone bridge. b) Determine the value of unknown capacitance using Schearing's bridge. c) Measure values of resistance, inductance and capacitance using LCR –Q meter.	06
4	IV	a) Operate front panel controls of CRO to observe various waveforms. b) Measure time, voltage, frequency, phase difference of input signals using CRO. c) Demonstrate features of digital storage oscilloscope. d) Measure Unknown frequency using Lissajous patterns.	10
5	V	a) Experiment with front panel controls of various signal generators and observe output Waveform. b) Demonstrate pattern on the CRO screen using pattern generator.	04
6	VI	a) Measure strain/stress using strain gauge measurement. b) Measure displacement using LVDT. c) Measure temperature using thermistor and thermocouple.	06
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

i. Explore data sheets/ technical specifications of transducers.
ii. Present seminar on advanced Instrumentation topic.
iii. Mini project based on transducer.
iv. Explore Circuit of temperature/pressure control.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Bridge simulation using Software like Electronic Workbench/ multiSIM.
ii. Seminar s /experts lecture and group discussion.
iii. Visit of Electronics Instruments calibration laboratories
iv. Students must be encouraged for self directed learning to improve LOs/ COs.

SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Electronic Instruments and Measurement Techniques	Cooper, W.D. Halfrick,	PHI Learning, New Delhi, latest edition
2	Electrical and Electronic Measurements	Sawhney, A.K.	Dhanpat Rai, New Delhi, latest edition
3	Elements of Electronic Instrumentation	H.S. Kalsi.	Tata McGraw Hill
4	Electronic Instrumentation and Measurements	David, Bell	PHI Learning, New Delhi, latest edition
5	Electronic Measurements and Instrumentation	Kishor, K Lal	Pearson, New Delhi, latest edition

9. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

i. Function generator
ii. D.C. power supply
iii. Cathode Ray Oscilloscope
iv. Digital Storage Oscilloscope
v. LCR-Q meter
vi. Experimental trainer kits, Bread board
vii. Pattern generator.
viii. Transducers.
ix. Analog & Digital multi-meter.

10. LEARNING WEBSITE & SOFTWARE

i. Electronic Workbench/MultiSIM/Circuit Maker
ii. ii.www.ocw.mit.edu
iii. iii.www.home.agilent.com

11. 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
CO1	Recall the basic concepts of instruments.	1	2											04
CO2	Measure various electrical parameters with accuracy, precision, resolution.		2	3										06
CO3	Measure relevant parameters using AC and DC bridges.	1	3	3									1	10
CO4	Operate front panel controls of CRO for appropriate measurements.		3	3										08
CO5	Experiment with Signal Generator, pulse generator for appropriate measurement.		3	3									2	10
CO6	Select appropriate passive or active transducers for measurement of physical phenomenon	1	2	3										10

Course Curriculum Design Committee

1. L.B . Kamkhede Lecturer , Department of Electronics and Telecommunication , Engineering ,Government Polytechnic , Aurangabad.
2. G. G. Vaishnav Lecturer , Department of Electronics and Telecommunication , Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) **(Chairman PBOS)**

COURSE TITLE: ELECTRONICS COMMUNICATION- I

COURSE CODE: 6X403

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	THIRD

1. RATIONALE

Wireless communication plays vital role in the field of electronic communication systems which includes radio, mobile and satellite communication systems. This requires that an electronic engineering diploma holder will have to maintain electronic communication equipment and circuits related to this area. This course is intended to lay the foundation for understanding the advanced communication courses in the subsequent semesters. Hence this course describes fundamentals of wireless communication covering analogue and digital modulation techniques. Since it is a basic core course, students should develop in depth understanding of all concepts and principles so that they may learn advance courses easily and effectively.

2. COMPETENCY

"Maintain Electronic Communication Systems."

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE(PR)# EXTERNAL	PR	150
4	0	2	06	80	20	25	25	

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

1) Classify & compare various signals & noises in communication systems, also illustrate different blocks in communication system.
2) Analyze the amplitude modulation, frequency modulation and phase modulation techniques.

3) Select particular modulation technique for specific application.
4) Examine the characteristics of radio receiver by inspecting super heterodyne receiver.
5) Categorize & analyze the various antennas & transmission lines according to its specification & Select an appropriate antenna for particular application.
6) Outline the concept of wave propagation & interpret propagation with respect to frequency & range.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Basics of Communication System**	1a. Identify different components of Communication system. 1b. Represent Sinusoidal, Rectangular, Saw-tooth, Impulse and Pulse waveform. 1c. Describe communication system 1d. Distinguish between external and internal noise and noise sources. 1e. Describe EM wave spectrum, frequency ranges & its applications. 1f. Justify the need of modulation. 1g. Differentiate between analog & digital modulation using waveforms.	1.1 Importance of Electronics Communication. 1.2 Signals and its representation: analog and digital Signal, Pulse, Impulse, Saw-tooth, sinusoidal and rectangular (In Time & frequency domain). 1.3 Digital Signal, Pulse, Impulse, Saw-tooth, sinusoidal and rectangular (in T & F domain). 1.4 Noise in communication system, classification of noise, signal to noise ratio(S/N) and noise figure. 1.5 Types of Electronics Communication: Simplex, Duplex- Full/ Half. 1.6 Electromagnetic (EM) wave spectrum, frequency bands & their applications. 1.7 Modulation: Definition & its classification, concept of digital modulation.
Unit – II **Amplitude and Angle Modulation**	2a. Derive the mathematical expression for Double Sideband Suppressed Carrier (DSBSC) Amplitude Modulation (AM) Signal. 2b. Sketch the frequency spectrum of the DSBSC Amplitude Modulated wave. 2c. Sketch the frequency spectrum of Single sideband (SSB) Amplitude Modulated wave.	2.1 Amplitude modulation: Frequency spectrum and mathematical expression for the Double sideband suppressed carrier (DSBSC) Amplitude Modulated wave. 2.2 Single sideband (SSB) Amplitude modulated wave. 2.3 Double sideband full carrier (DSBFC) Amplitude Modulated wave. Modulation Index, carrier

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	2d. Derive mathematical relation between carrier power, modulated signal power and modulation index of DSBFC AM signal. 2e. Calculate total transmitted power for single and multiple modulating signals. 2f. Explain generation of AM signal using square law modulator circuit. 2g. Calculate the modulation index and bandwidth of frequency modulated (FM) signal. 2h. Discriminate between phase and frequency modulation with Relevant sketches. 2i. Distinguish between Pre-emphasis and De-emphasis. 2j. Describe various FM signal generation techniques	power, modulated signal power and modulation Index. 2.4 Single and multiple signal modulation. 2.5 AM using square law modulator circuit. 2.6 Mathematical representation of FM wave, Frequency spectrum, Modulation index and Bandwidth of FM. 2.7 Phase Modulation (PM) and FM. 2.8 Pre-emphasis and De-emphasis Circuits . 2.9 Generation techniques for FM wave : 2.9.1 Basic reactance modulation 2.9.2 Varactor diode modulation 2.9.3 Stabilized reactance FM modulator
Unit – III **AM and FM receivers**	3a. Define the characteristics of radio Receiver. 3b. Describe the functions of each block of super heterodyne receiver. 3c. Describe AM detection method. 3d. Explain working of various types of FM demodulator circuits. 3e. Explain functions of various blocks of FM receiver. 3f. Explain working of communication receiver using a Block diagram. 3g. Describe need and working of Squelch circuit. 3h. Describe need and working of Amplitude limiting circuit. 3i. Describe need and working of AGC circuit	3.1 Characteristic of radio receiver, Sensitivity, Selectivity, Fidelity, Image frequency Rejection . 3.2 Block diagram of super heterodyne Receiver. Block diagram of basic FM receiver. 3.3 Envelope detector using diode. 3.4 Basic FM demodulators: Slope detection, Balanced slope detection, Phase discriminator, Balanced ratio detector. 3.5 Communication receiver: Double conversion principle. 3.6 Squelch circuit, Amplitude limiting action, Automatic gain control circuits and its Working. 3.7 Alignment procedure of Radio receiver, probable faults in Radio receiver, symptoms & remedies on it.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – IV **Antenna & Transmission Lines**	4a. Distinguish between antenna and aerial. 4b. Calculate the basic antenna parameters using standard formulas. 4c. Identify antenna specifications required from standard Hand books. 4d. Classify antennas used in VHF/ UHF band.	4.1 Basic parameters: Aerial and antenna, Antenna Impedance. Radiation Resistance, Radiation Pattern, Beam area and beam efficiency, Isotropic radiator, directivity and Gain, radiation intensity, half power BW, radiator gain, directivity and Gain, length of antenna, effects of antenna height. 4.2 VHF/UHF antennas: Helical antenna, Parabolic reflector antenna, Horn antenna, Micro strip (patch) antenna, Turnstile and super turnstile antenna, slot antenna. 4.3 Fundamentals of Transmission lines: General, RF equivalent, Characteristics impedance, losses in transmission lines. 4.4 Standing waves: With load terminals open Circuited, short circuited, SWR, VSWR. 4.5 Quarter wave & Half wave length line, Properties of lines of various length 4.6 Impedance matching: Stub (Single & double), Baluns.
Unit – V **Wave Propagation**	5a Explain the effect of ground on electromagnetic waves propagation. 5b. Explain the properties of Ionospheric layer used for electromagnetic wave propagation. 5c. Explain different modes of electromagnetic wave propagation 5d. Select the antennas for specific mode of wave propagation considering all the aspects .	5.1 Ground wave propagation. 5.2 Ionosphere Layers and Sky wave propagation: Virtual Height, Critical frequency, Maximum usable frequency (MUF), Skip distance Lowest Usable frequency (LUF), Optimum Usable frequency (OUF) 5.3 Space Wave propagation: Tropospheric scattered propagation, Duct Propagation

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basicsof communication system	10	04	04	02	10
II	Amplitude and Angle modulation	15	04	10	06	20
III	AM and FM Receivers	15	05	10	05	20
IV	Antenna & Transmission Lines	12	05	10	05	20
V	Wave Propagation	12	03	03	04	10
Total		**64**	**21**	**37**	**22**	**80**

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/Exercise	Approx. Hrs. Required
1	I	Observe un dermodulated, 100% modulated & over modulated AM	2
2	II	Measure modulation index of an AM envelope.	2
3	II	Measure modulation index of an AM envelop by trapezoidal Method.	2
4	II	Observe FM wave using varactor diode modulator.	2
5	II	Determine Modulation Index of Frequency Modulated wave.	2
6	II	Locate various sections of AM radio receiver trainer kit and draw the waveforms at input and output side of each section.	2

7	II	Check the demodulated AM signal waveform using envelope detector and draw its input output waveform.	2
8	III	Obtain the response of AGC circuit of the radio receiver.	2
9	III	Study of Demodulation of FM.	2
10	III	Observe & Plot graph of RF characteristics of Radio receiver.	2
11	IV	Study of Transmission lines parameters.	2
12	IV	Measure the Characteristic impedance of Co-axial cable. Find the impedance & VSWR	2
13	IV	Study of Various Antennas	4
14	IV	Plot radiation pattern of Yagi Uda Antenna	2
15	II	Visit to Radio Station.	2
		Total	**32**

8. SUGGESTED STUDENTS ACTIVITIES :

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Students should be shown animations/video films to explain the working concept of different types of Diodes, transistors, ICs, amplifiers, oscillators, regulated power supply etc.
2. Samples of the electronic components and devices should be brought in the class for demonstration while teaching those components and devices

9. SUGGESTED LEARNING RESOURCE

Following is the list of proposed student activities.

i Explore circuit of AM / FM receiver, assemble and test it

ii Explore circuit of AM / FM transmitter.

iii Collect details of HAM radio and CB radio and watch the working demonstration if possible.

iv Explore details (Freq. / Standards/Company/Model/Range) of Walky-Talky, Cordless phone and Wireless set used by Police department.

v Industrial Visit of AM / FM Radio Transmitter

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. CRO – Dual trace, 100 MHz
2. AM/FM radio receiver trainer Kit
3. Communication receiver Kit
4. RF generator/wideband oscillator

11. LEARNING WEBSITE & SOFTWARE

1. www.nptel.iitm.ac.in (lectures on Electronics and Communication)
2. www.youtube.com. (lectures on Electronics and Communication)
3. www.howstuffworks.com

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**	**PSO3**	**No. of hours allocated in urriculum**
CO1	Classify & Compare various signals & noise in communication systems, also illustrate different blocs in communication.	1	3	1	1	-	-	-	-	-	-	-	-	-	10
CO2	Analyze the amplitude modulation, frequency modulation and phase modulation techniques	3	3	3	3	-	-	-	-	-	-	-	-	-	15
CO3	Select particular modulation technique for specific application	1	2	2	2	-	-	-	-	-	-	-	-	-	08
CO4	Examine the characteristics of radio receiver by inspecting super heterodyne receiver	1	2	2	2	-	-	-	-	-	-	-	-	-	08
CO5	Categorize & analyze the various antennas & transmission lines according to its specification & select the an appropriate antenna for particular application	3	3	2	1	-	-	-	-	-	-	-	-	-	12
CO6	Outline the concept of wave propagation & interpret propagation with respect to frequency & range.	2	3	-	-	-	-	-	-	-	-	-	-	-	12
		2	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-	**64**

Course Curriculum Design Committee :

Sr No	Name of the Faculty members	Designation and Institute
1	**Dr. R. G. WADEKAR**	HOD, Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad
2	**PROF. R. A. BURKUL**	Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad.
3	**PROF. G. G. VAISHNAV**	Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

GOVERNMENT POLYTECHNIC, AURANGABAD

(An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre [6th Revision : Outcome Based Education -2017-18]

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

FOURTH Semester Courses

Sr. No.	SEM	Course code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)								
				Theory (TH)	Practical (PR)	Tutorial (TU)	Total Credit (C)	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Practical Exam Hours	Remarks
1	IV	6X207	Electronics Workshop	0	4	_	4	--	--	25#	_	50	75	--	2	
2	IV	6G306	Entrepreneurship Development	2	2	_	4	--	--	--	_	50	50	--	2	
3	IV	6X402	Linear Integrated Circuits	3	4	_	7	20	80	25@	_	25	150	3	2	
4	IV	6X405	Electronics Devices and Circuits –II	3	4	_	7	20	80	25#	_	25	150	3	2	
5	IV	6X408	Microcontroller	3	2	_	5	20	80	25#	_	25	150	3	2	
6	IV	6X410	Electronics Communication-II	3	2	_	5	20	80	25@	_	25	150	3	2	
7		**ANY ONE FROM GROUP ELECTIVE -1**														
A	IV	6X414	Automobile Electronics –I	3	2	_	5	20	80	25@	_	25	150	3	2	
B	IV	6X415	Digital Circuits & Systems	3	2	_	5	20	80	25@	_	25	150	3	2	
C	IV	6X416	Instrumentation & Control-I	3	2	_	5	20	80	25@	_	25	150	3	2	
D	IV	6X417	IndustrialAutomation & Control-I	3	2	_	5	20	80	25@	_	25	150	3	2	
In plant training of 2/3/4 weeks between 4th and 5th semester [Summer vacation]:Report submission [PA] during 5th semester ESE [OR] [Internal]																
		TOTAL					**37**	**100**	**400**	**150**	_	**225**	**875**			

Legends : TH-Lecture; TU-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

HOD Electronics and Telecomm Engineering

Govt. Polytechnic, Aurangabad.

COURSE TITLE: ELECTRONICS WORKSHOP

COURSE CODE: 6X207

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FOURTH

1. RATIONALE

Electronic Workshop is a basic course which is highly significant for the technicians to play instrumental role in the field of design and testing of electronic circuits in industries. This course contains all essentials to acquire the skills of design, fabrication, assembly and testing of PCBs for Electronic circuits & Systems.

2. COMPETENCY

Troubleshoot electronic circuits.

3. TEACHING AND EXAMNATION 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)# EXTERNAL	PA	
0	0	4	4	00	00	25	50	75
	Total			--	--	2	--	

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 Examiner

4. COURSE OUTCOMES

1. Identify SMDs, SMCs, active and passive components.
2. Read and interpret electronic circuit diagrams, Data sheets of components.
3. Draw the circuit diagram and its PCB using software
4. Assemble and test the circuits using software and bread board.
5. Troubleshoot the electronics circuits.
6. Develop Mini-project.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
Unit –I **PCB Design**	1a. Explain need of PCB Design 1b. Identify SMDs, SMCs, active and passive components.	1.1 Introduction 1.2 Concept of PCB 1.3 Necessity of PCB 1.4 types of material used for PCB (Copper clad, Glass Epoxy) 1.5 Identify surface mounted devices [SMDs], surface mounted components [SMCs], active and passive components.
Unit– II **PCB Fabrication**	2a. Prepare Artwork 2b. Prepare film master 2c. Select suitable tools for machining operations	2.1 photo printing, Screen printing 2.2 photo resist material, Chemicals required 2.3 Frame making, Ink used for development. 2.4 Developing the screen printing master 2.5 Etching 2.6 Mechanical machining operations. 2.7 Tools for Shearing, sawing, punching, Drilling.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
Unit– III **Components Assembly**	3a. Assemble the components	3.1 Types of soldering irons, components of soldering iron, Types of bits and material used. 3.2 Temperature controller for soldering irons, soldering material and fluxes used. 3.3 concept of wave soldering 3.4 Cabinet designing, Mounting of PCB and allied Components in the cabinet a. Exposure to standard cabinet b. Use of catalogs of cabinet
Unit– IV **PCB Designing Using software**	4a. Prepare of PCB Design 4b. Draw the circuit diagram 4c. Draw PCB artwork using software	4.1 Preparation of circuit diagram 4.2 using components from library 4.3 Inter-connection of components by wires. 4.4 Check the electrical design rules and preparation of net list. 4.5 prepare final circuit diagrams 4.6 Along with Bill of material 4.7 Preparation of foot print of components which are not present in Component library. 4.8 back annotation of the components and preparing thecomplete circuit Diagram. 4.9 Converting the circuit diagram into a PCB layout and getting the 4.10 Printout of each layer. 4.11 Use of dedicated softwares liks CAD, PROTEL, CADSTAR, EASYTRAX ETC 4.12 Finally preparing a PCB.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
Unit – V **Troubleshooting of the Electronics Circuits.**	5a. Read and interpret electronic circuit diagrams, Data sheets of components. 5b. Troubleshoot the electronics circuits.	5.1 Reading a circuit diagram 5.2 Nature of faults location, fault Finding aids. 5.3 Troubleshooting techniques and procedures 5.3 Systematic troubleshooting checks and Corrective actions 5.4 Grounding systems in electronics equipments 5.5 Preventive maintenance 5.6 Troubleshooting in digital circuits
Unit-VI **Surface Mounted Devices and MINI PROJECT**	6a. Collect information on SMD's and their types 6b. Solder SMCs and SMD's 6c. Desolder SMCs and SMDs 6d. Develop mini project	6.1 Surface mounted devices [SMD]: 6.2 Types 6.3 Soldering and Desoldering techniques 6.4 of SMD's 6.5 Circuit Diagram of miniproject 6.6 layout and Artwork of mini-project. 6.7 6.5 Assembly of component and testing.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours/Practical Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**PCB Design**	**10**	**Not Applicable**			
II	**PCB Fabrication**	**08**				
III	**Components**	**10**				

Unit No.	Unit Title	Teaching Hours/Practical Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Assembly					
IV	**PCB Designing Using software**	**10**				
V	**Troubleshooting of the Electronics Circuits.**	**10**				
VI	**MINI PROJECT**	**16**				
	TOTAL	**64 HOURS**				

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	PCB Design	10
2.	II	PCB Fabrication	08
3.	III	Components Assembly	08
4.	IV	PCB Designing Using software	10
5.	V	Troubleshooting of the Electronics Circuits.	10
6.	VI	1. Collect information on SMD's and their types, prepare a chart. 2. Use techniques for soldering SMD's and SMcomponents 3. Use techniques for desoldering SMD's and SMcomponents **4. Develop a MINI PROJECT**	08 10
Total			**64 hours**

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1. **PCB Design**
2. **PCB Fabrication**
3. **MINI PROJECT**

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Motivate students to prepare PCB Design, fabrication and assembly.

2. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1.	Printed Circuit Boards: Design and Technology	Bosshart	TMH, 2008 or latest edition
2.	Making Printed Circuit Boards	Jan Axelsen	Mc GrawHill, 1993 or latest edition
3.	Hobby Electronics Project Special	BPB	B P B, 2011

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Sr.No.	Name of the Equipment	Specification
1	Multimeter, CRO, DC Power supply, Function generator, LCR –Q meter.	
2	1. Drilling Machine with drill bits 2. Solder iron, Solder-stand, De-soldering pump 3. Cutter, Nose plier, screw driver set, Wire stipper, Desolder wick, Flux, Solder wire, Hook up wire, Flexible wire, Hylem board 4. Bread board, General purpose Copper clad laminate sheet	

12. LEARNING WEBSITE & SOFTWARE

www.engineersgarage.com

www.alldatasheet.com

www.allelectronics.com

www.instructables.com/id/Soldering-and-Desoldering-Surface-Mount-Components/

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	No. of hours allocated in curriculum
CO1	Read and interpreat circuit diagrams, Data sheet of components.	0	3	0	3	3	0	0	0	0	0	0	0	**10**
CO2	Testing the circuit using software and bread board.	0	2	0	2	2	0	0	0	0	0	0	0	**08**
CO3	Drawing the circuit diagram and its PCB using software.	0	3	0	2	2	0	0	0	0	0	0	0	**10**
CO4	Troubleshooting of the electronics circuits.	0	2	2	2	1	0	0	0	0	0	1	0	**10**
CO5	To develop Mini-project.	0	3	3	3	3	0	0	0	0	0	3	0	**26**
			3	1	2	2						1		

Course Curriculum Design Committee :

Name and Designation of Course Designer:-1Shri S.V.Salimbekar

(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	**FOURTH**

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.	2.1 Information 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 BUSSINESS RELATED SOFTWARES**	7a. Use business related software's. 7b. Survey Software's used in Mall, industries. 7c. Identify Software's used For accounting.	**INTRODUCTION BUSSINESS RELATED SOFTWARES** 7.1 Software's used in Mall. 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.	06
5	VI	Preparation of Preliminary / Detailed project report in the formats recommended by MCED/MITCON Prepare project report and study its feasibility.	06
6	VI	At least one case study of successful entrepreneur.	04
7	---	Assess yourself-are you an entrepreneur?	04
Total			**32**

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

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

CO. NO.	**Course Outcome**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**No. of hours allocated in curriculum**
CO 1	Apply business/enterprise principals and characteristics.	3	3					2		3		2	6
CO 2	Design information and supporting system related to start a business.	3	3					3		3			8
CO 3	Estimate and record financial requirements.	3	3					3		3		2	6
CO 4	Develop detailed project report.	3	3							3	2		6
CO 5	Use various software related to business.	3	3							3	3		6

Course Curriculum Design Committee

Prof. A. W. Nemade Lecturer in Mechanical Engineering, Govt. Polytechnic,Aurangabad

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE : LINEAR INTEGRATED CIRCUITS

COURSE CODE : 6X402

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FOURTH

1. RATIONALE

This course deals with basic concepts of operational amplifier, linear and non-linear applications of OP-Amp.Operational amplifier finds its applications in the domain of medical electronics, instrumentation, signal conditioning circuits etc. Operational amplifier is key factor in the performance of various electronic circuits. Undertaking this course will develop skills among the students to maintain the IC based linear electronic circuits.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

"Assemble analog circuits consisting of OP-Amp & components"

3. TEACHING AND EXAMNATION 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	150
3	0	4	07	80	20	25	25	
	Exam Hours			03	01	02	--	

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

Theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes. Students will be able to

1. Illustrate electrical parameters of OP_AMP
2. Experiment with basic OP-AMP circuits.
3. Demonstrate special OP-AMP circuits for specific applications
4. Select & Test desired voltage regulator IC.
5. Experiment with ICs-555, 565 and 566.
6. Classify active filters & demonstrate first order filters.

5. DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I OPERATIONAL AMPLIFIERS	1a. Illustrate electrical parameters of OP_AMP 1b. Explain the working of OP-Amp. 1c. Compare open loop and closed loop configurations of Op-Amp	1.1 Electrical properties, transfer characteristics & parameters of ideal OP AMP, 1.2 Block diagram & operating principle] 1.3 Definition of OP AMP parameters [PO2] 1.4 Symbol, pin diagram, ratings of IC 741, [PO2] 1.5 Equivalent circuit of OP AMP. Open-loop OP-AMP Configurations, instability in open-loop configuration [PO2] 1.6 OP-AMP with negative feedback
Unit –II OP AMP BASIC CIRCUITS	2a. 2a. Explain the working of inverting and non-inverting types of OP_AMP configurations. 2b. Distinguish between the working of Summing, Scaling and Averaging amplifier. 2c. Discriminate the working of	2.1 Virtual ground concept [PO2] 2.2 Open loop configuration– Inverting , Non inverting [PO2] 2.3 Close loop configuration – Inverting, non- inverting, differential amplifier, unity gain amplifier (voltage follower), inverter (sign changer) [PO1,

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	adder, subtractor, Integrator, Differentiator circuits 2d. Experiment with basic OP-AMP circuits. 2e. Design of adder, subtractor circuits	PO2, PO3, PO4] 2.4 Inverting & non-inverting configuration of Adders (summing, scaling, averaging amplifier) 2.5 Substractor (Numerical based on designing of above circuit) 2.6 Practical Integrator & Practical Differentiator.
Unit –III SPECIAL OP AMP CIRCUITS	3a. Explain the working principle of OP_AMP as Bridge & Instrumentation Amplifier. 3b. Discriminate the working of voltage to current converter, 3c. current to voltage converter. 3d. Explain the working principle of different types of oscillators using OP_AMP. 3e. Demonstrate special OP-AMP circuits for specific applications	3.1 Bridge amplifier, instrumentation amplifier with two & three OP AMPS. 3.2 V-I converters, I-V converters, logarithmic & Antilogarithmic amplifier 3.3 Oscillators- Principle, types, frequency stability. 3.4 Phase shift oscillator, wien bridge oscillator, Quadrature oscillator 3.5 Astable, Monostable and Bistable Multivibrator using OP AMP. (Numerical based on above)
Unit-IV VOLTAGE REGULATORS	4a. Classify the Regulators. 4b. Identify various types of ICs & packages of Regulator. 4c. Explain the working of different IC voltage regulator circuits 4d. Select & Test desired voltage regulator IC.	4.1 Linear voltage regulator: Block schematic, pin diagrams, features, Specifications, rating and operating principle of IC 723, 78xx, 79xx series. 4.2 Switching regulator: Block schematic, pin diagram, features, specifications, ratings and operating Principle of switching regulator IC LM 317, LM337 Regulator.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		(Numerical based on above)
Unit - V COMPARATORS AND TIMERS	5a. Select the relevant comparators for any given linear circuit. 5b. Illustrate application of Timer IC 555 as multivibrator. 5c. Experiment with ICs-555, 565 and 566. 5d. Illustrate Application of PLL in FM demodulation.	5.1 Op-Amp as comparator, Study of Op-amp peak to peak detector, phase detector circuit, voltage level detector circuit. 5.2 Schmitt trigger using op-amp. 5.3 Study of timer IC – 555, Block diagram, Operating principle, pin diagram, Features of IC-555 5.4 IC-555 as Astable, Monostable, bi-stable & Schmitt Trigger. Sample and hold circuit. (Numerical based on above) 5.5 Phase Locked Loop- Principle & block diagram of PLL, Transfer characteristics, lock range & capture range. 5.6 Special purpose IC's: IC 565 (phase lock loop), IC 566 (voltage controlled oscillator), its block diagram and pin diagram, application of PLL such as FM Demodulation, AM demodulation, Frequency synthesis & frquency division.
Unit - VI ACTIVE	6a. Classify active filters 6b. Compare Filters. 6c. Design first order active filters	6.1 Introduction to Filters, Classification Of Filters, Merits & Demerits of Active Filters

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
FILTERS		Over Passive Filters. 6.2 First order low pass , high pass Butterworth filter design. Band pass & Band reject filter design. (Numerical based on above)

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	OPERATIONAL AMPLIFIERS	8	06	04	04	14
II	OP AMP BASIC CIRCUITS CIRCUITS	8	06	04	04	14
III	SPECIAL OP AMP CIRCUITS.	8	08	08	04	20
IV	VOLTAGE REGULATORS.	8	06	02	04	12
V	COMPARATORS AND TIMERS	8	02	04	06	12
VI	ACTIVE FILTERS	8	02	02	04	08
	Total	**48**	30	24	26	80

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	1. To Interpret the parameters of given Op-Amplifier from data sheet.	02
2	II	1. To test performance of OP_AMP as an inverting & Non inverting amplifier and observe input/output waveforms. To test performance of OP_AMP as unity gain amplifier. 2. To design and test performance of OP_AMP as an Adder &	10

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Subtractor. 3. To test performance of OP_AMP as an Integrator & Differentiator.	
3	III	1. To test performance of OP_AMP Instrumentation Amplifier calculate gain & frequency response. 2. To build & test Astable multivibrator using IC 741 for different values of R and C. 3. To build/test Monostable multivibrator using IC 741 for different values of R and C.To build & test Schmitt's trigger using IC 741 4. To implement & test Phase shift oscillator using IC 741. 5. To implement & test Wien Bridge oscillator using IC 741.	16
4	IV	1. To build & test fixed/variable voltage regulator using LM723 & plot line/ load regulation characteristics. 2. To build & test variable voltage regulator using LM317 & measure the dropout voltage & plot line/ load regulation characteristics. 3. To build & test variable voltage regulator using LM337 & measure the dropout voltage & plot line/ load regulation characteristics. 4. To build & test voltage regulator using 78xx and 79xx and measure the dropout voltage & plot line/ load regulation characteristics..	12
5	V	1. To test performance of OP_AMP comparator. 2. To test performance of OP_AMP peak to Peak detector 3. To test performance of OP_AMP phase detector. 4. To build & test Astable multivibrator using IC 555 for different values of R and C. 5. To build/test Monostable multivibrator using IC 555 for different values of R and C. 6. To build & test Bistable multivibrator using IC 555 7. To verify output of VCO using IC 565.	16

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
6	VI	1. To test performance of OP_AMP as Low Pass active filter 2. To test performance of OP_AMP as High Pass active filter 3. To test performance of OP_AMP as band Pass active filter Micro-projects: [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. I 2. Y 3.	08
Total			64

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

i. Collect different datasheet of Op-Amp and list the parameter values that are affecting the operation of op-amp while in use.

ii. Observe the output parameter values as well as waveforms using simulation and compare it with practical results.

iii. Make a comparative table for various op-amps parameters.

iv. Make universal test board for op-amp to check the performance of various circuits build using op-amp and discrete components

v. Assignments on solving numerical.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Show video/ animation/ PPT films on working of different types of Op-Amps.

ii. Give assignments/ mini projects based on application of Op-Amps.

iii. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Op-Amps and Linear Integrated Circuits	Gayakwad R. A.	PHI Learning, New Delhi, 2009, 4th edition or latest
2	Linear Integrated Circuits & Appli.	Bakshi U. A. , Godse A. P.	Technical Publications (2010), Pune, 1st edition
3	Linear Integrated Circuits & Appli.	D Roy Chaudhary , Shail B Jain	New Age International Publications , Latest edition
4	OP Amplifier	Clayton	TMH

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

Trainer Kits for

i. Digital multimeter (3-3/4 digit)
ii. DSO/ Oscilloscope(50Mhz,2 channel)
iii. Function Generator(50Mhz)
iv. DC power supply (30V-0-30)V DC.
v. Circuit boards/Educational Kits/ Components.
vi. Breadboards, soldering station.

11. LEARNING WEBSITE & SOFTWARE

1. http://www.electronics-tutorials.ws/opamp/opamp_1.html
2. http://educypedia.karadimov.info/electronics/electronicaopening.htm
3. http://www.analog.com/library/analogDialogue/archives
4. www.nptel.com

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
CO1	Illustrate electrical parameters of OP_AMP	-	3	-	-	-	-	-	-	-	-	-	-	-	06
CO2	Experiment with basic OP-AMP circuits.	2	2	2	2	-	-	-	-	-	-	-	-	-	07
CO3	Demonstrate special OP-AMP circuits for specific applications	3	3	3	3	-	-	-	-	-	-	-	-	-	10
CO4	Select & Test desired voltage regulator IC.	2	2	2	2	-	-	-	-	-	-	-	-	-	07
CO5	Experiment with ICs-555, 565 and 566.	2	3	3	3	-	-	-	-	-	-	-	-	-	12
CO6	Classify active filters & demonstrate first order filters.	2	2	2	2	-	-	-	-	-	-	-	-	-	06

Course Curriculum Design Committee :

Dr. R. G. WADEKAR HOD , Electronics and Telecommunication Engineering , Government Polytechnic , Aurangabad

PROF S.D NIMBEKAR Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- : ELECTRONICS DEVICES & CIRCUITS-II

COURSE CODE : 6X405

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FOURTH

1. RATIONALE

Analog electronic components and circuits are building blocks for any electronic gadget used in industries or in daily life. It is therefore necessary for electronics engineers to understand clearly their principles and functioning. This course will cover the basics of construction, working, and applications of various types of electronic components and circuits. Practical exercises of this course would enable students to maintain such circuits and in turn maintain equipment having such circuits. This course is therefore one of the basic core courses which is must for every electronic engineer and hence should be taken very sincerely by students.

2. COMPETENCY

Construct analog circuits consisting of Active & Passive components.

3. TEACHING AND EXAMNATION 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 EXTERNAL	PA	150
3	0	4	8	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Illustrate with waveforms working of Clipper & Clamper circuits.
2. Interpret effect of positive & Negative feedback.
3. Calculate overall gain of feedback amplifier & effect of feedback on amplifier parameters.
4. Solve numerical based on RC, LC oscillators for given parameters.
5. Compare construction & working of JFET & MOSFET.
6. Calculate efficiency of various types of power amplifiers.

5. DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Wave Shaping circuits**	1a Explain RC differentiator & integrator. 1b Compare working of positive/ negative clipper 1c Compare working of positive/ negative clampers. 1d Illustrate with waveforms working of Clipper & Clamper circuits.	1.1 The diode as a switch, Ideal characteristics Ideal Transistor switch. Practical transistor switch, Transistor switching times, improving switching times. 1.2 Types of wave forms: Sinusoidal, Rectangular, Ramp, Pulse, step, exponential. 1.3 RC Circuits : 1.3.1 Capacitor charging, RC circuit operation, equation, response to square wave. 1.3.2 Integrating, differentiating circuit. 1.4 Clipper: 1.4.1 Positive, Negative, Biased positive, biased negative, Combinational, Series and Shunt clippers. Comparison of all types. 1.4.2 Working, Input & Output Waveforms, transfer characteristics of all types of clippers. 1.5 Transistorized wave shaping circuits: positive and Negative clampers. (Simple Numerical based on above)

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –II **Feedback Amplifier**	2a Highlight the merits and demerits of negative feedback over positive feedback. 2b Explain the concept of negative feedback related to amplifier. 2c Interpret effect of Negative feedback on amplifier parameters. 2d Calculate overall gain of feedback amplifier.	2.1 Concept of feedback: negative & positive 2.2 Merits and demerits of negative feedback. 2.3 Negative feedback in amplifiers 2.4 Derivation of equation for overall gain of negative feedback amplifier. 2.5 Feedback connection types, effect of negative feedback on gain, input impedance, output impedance & Bandwidth 2.6 Practical feedback circuits- voltage series, Current series, voltage shunt using transistors.
Unit-III **Oscillators.**	3a Justify the use of positive feedback and tank circuit in oscillator 3b Explain the working principle of different types of oscillators 3c List applications of various types of oscillators. 3d Solve numerical based on RC, LC oscillators for given parameters.	3.1 Introduction to oscillators 3.2 Positive feedback in oscillators 3.3 Barkhausen's criteria for oscillation. 3.4 Overall gain of positive feedback amplifier. 3.5 Transistor RC phase shift oscillator circuit 3.6 Transistorized Hartley oscillator circuit 3.7 Transistorized Colpitt's oscillator circuit 3.8 Transistorized Wien Bridge oscillator circuit 3.9 Equivalent circuit of crystal, Crystal oscillator. (Simple Numerical based on above)
Unit –IV **Multi-vibrators**	4a Explain the working principle of Transistor Schmitt's Trigger. 4b Explain the working principle of different types of Multi-vibrators. 4c Compare working of Astable/ Monostable multivibrators.	4.1 Transistor Schmitt's Trigger 4.2 Collector coupled & emitter coupled Bistable multivibrator. 4.3 Methods of triggering: Asymmetrical & Symmetrical Triggering. 4.4 Collector & base triggering, use of commutating. 4.5 Monostable & Astable multivibrator.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit - V **Field Effect Transistor**	5a Explain construction and working principle of JFET 5b Describe configurations of JFET amplifier 5c Explain construction and working principle of enhancement type MOSFET 5d Compare working of JFET and MOSFET	5.1 Construction and Characteristics of JFETs 5.2 Drain & Transfer Characteristics 5.3 Parameters of JFET – rd, gm, μ 5.4 n-channel and p-channel JFET 5.5 JFET configurations: common source, common drain and common gate. 5.6 Difference between BJT & JFET 5.7 Depletion type MOSFET: Basic Construction, Operation & Characteristics. 5.8 Enhancement type MOSFET: Basic Construction, Operation & Characteristics. 5.9 Difference between JFET & MOSFET
Unit - VI **Power Amplifier**	6a Differentiate between voltage and power amplifier 6b Explain working of different types of power amplifier and their applications 6c Determine the efficiency of Class A and Class B type of power amplifiers 6d Explain working of Push Pull amplifiers 6e Calculate the efficiencies of Push Pull amplifiers.	6.1 Voltage and power amplifier Classification of power amplifier 6.2 Working of Class A, Class B, Class C, Class AB amplifiers and applications of each. 6.3 Efficiency of class A, class B & transformer coupled class A power amplifier. 6.4 Operation of class B push-pull power amplifier. 6.5 Efficiency of class B push pull amplifier. 6.6 Complimentary symmetry push-pull amplifier.

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	Wave shaping Circuits	**8**	02	4	6	12
II	Feedback Amplifiers	**8**	02	4	6	12
III	Oscillators	**8**	04	4	6	14
IV	Multivibrators	**8**	02	4	8	14
V	Field Effect Transistor.	**8**	02	4	8	14
VI	Power Amplifier	**8**	04	4	6	14
	Total	**48**	**16**	**24**	**40**	**80**

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	a. Test diode, transistor, FET and MOSFET using multimeter.	2
2		b. Observe and draw input, output waveforms of positive biased and negative biased clipper by changing biasing voltage.	4
3		c. Observe input, output waveforms of clamper and note the clamping voltage.	2
4		d. Observe the response of RC differentiator using various signal inputs.	2
5		e. Observe the response of RC integrator using various signal inputs.	2
6	II	f. Test the performance of negative feedback amplifier and compare gain, BW with & without feedback.	4

S. No.	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
7	III	g. Build/test Colpitts oscillator using Transistor for variable frequency & observe waveforms on CRO.	4
8		h. Build/test Hartley oscillator using Transistor for variable frequency & observe waveforms on CRO..	4
9		i. Build/test Wien bridge oscillator using Transistor for variable frequency & observe waveforms on CRO.	4
10		j. Build/test Phase shift oscillator using Transistor for variable frequency & observe waveforms on CRO.	4
11	IV	k. Observe the output waveforms of Transistor Schmitt circuit and find UTP, LTP.	2
12		l. Observe and draw waveforms, calculate frequency of Astable multivibrator	2
13		m. Observe and draw waveforms, calculate pulse width of Monostable multi vibrator	2
14	V	n. Plot drain & Transfer characteristics of JFET.	2
15	VI	o. Build/test transformer coupled class-A Power amplifier.	4
16		p. Build/test class-B Power amplifier.	4
17		q. Build/test class-C Power amplifier.	4
18		r. Build/test class-AB Power amplifier.	4
19		**Micro project based on content of curriculum.**	**8**
Total			**64**

Note : Any 10 Experiments from above.

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

i. Find Specifications and packages of Diode, Transistor, FET, MOSFET from datasheet.

ii. Assignments on solving numerical.

Mini projects: (Should be given individual basis from following.)

- Assemble Oscillators using Transistor & observe waveforms on CRO.
- Assemble Multi-vibrator using Transistor & observe waveforms on CRO.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Industrial Visits nearby Industries to see the industrial applications of Semiconductor devices & circuits.
2. Internet Based assignments.
3. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Applied electronics	R S Sedha	S Chand & Compony
2	Integrated Electronics	Millman Halkies	Tata Mc Graw Hill
3	Pulse & Switching Circuits	Millman Taub	Tata Mc Graw Hill
4	Electronics Devices & Circuits	David Bell	Prentice Hall india
5	Electronics Devices & Circuits	Allen Mottershed	Prentice Hall india
6	Electronics Devices and Circuit Theory.	Boylestad, Robert & Louis, Nashelsky	Pearson, 10th Edition

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

a. Clipper & Clampers.

b. Feedback Amplifiers & Oscillators

c. Astable & Monostable MV

d. JFET & MOSFET Characteristics.

e. Power Amplifiers.

f. Instruments Like, CRO, Function Generator, Power supply, Digital multimeter, bread board, etc.

11. LEARNING WEBSITE & SOFTWARE

a. www.nptel.iitm.ac.in

b. www.youtube.com. (lectures on Basic Electronics)

c. www.howstuffworks.com

d. www.alldatasheet.com

e. Electronics Work bench

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	PSO3	No. of hours allocated in curriculum
CO1	Illustrate with waveforms working of Clipper & Clamper circuits.	2	3	3	3										6
CO2	Interpret effect of positive & Negative feedback.	3	2	2	3										8
CO3	Calculate overall gain of feedback amplifier & effect of feedback on amplifier parameters.	3	2	3	2										8
CO4	Solve numerical based on RC, LC oscillators for given parameters	3	2	3	2										8
CO5	Compare construction & working of JFET & MOSFET.	3	2	3	2										8
CO6	Calculate efficiency of various types of power amplifiers.	3	2	3	2										10

Course Curriculum Design Committee

- S.D. Sutawane, Lecturer , Department of Electronics and Telecommunication Engineering, Government Polytechnic , Aurangabad
- S.D. Nimbekar, Lecturer , Department of Electronics and Telecommunication Engineering, Government Polytechnic , Aurangabad

HOD ET(Chairman PBOS) Co-ordinator(CDIC)Member secretary

COURSE TITLE- : MICROCONTROLLER

COURSE CODE : 6X408

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**FOURTH**

1. RATIONALE

This course comes under emerging technology. The course is an extension of concepts covered in digital techniques. The hardware & software concepts of 8051 are included in this course. The low cost, huge range, easy availability and wide spread use of the 8051 family makes it an excellent platform for developing microcontroller based systems, these same factors make it an excellent ideal platform for learning about microcontrollers. Microcontroller is heart of all industrial automation, consumer goods, domestic and other high end products. It will also help in understanding design of simple microcontroller systems. This course will be particularly useful for students seeking a future in robotics & embedded systems.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

"Develop simple Microcontroller based systems."

3. TEACHING AND EXAMNATION 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) # EXTERNAL**	**PA**	
3	--	2	5	80	20	25	25	150
	Exam Hours			3	2			

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

1. Select a microcontroller for a specific application.
2. Interface peripherals to microcontroller.
3. Develop logic for assembly language programming.
4. Execute assembly language programs.
5. Develop programs using software development tool viz. Keil IDE.
6. Develop a small microcontroller based systems.

5. DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Introduction to Micro-controllers**	1a. Distinguish between microprocessor and microcontroller 1b. Compare different members of 8051 family. 1c. Select a microcontroller fof an application	1.1 General block diagram of microprocessor and microcontroller 1.2 Comparison of Microprocessors and Microcontrollers. 1.3 Commercial family of 8051 microcontrollers. 1.4 Types of architectures – Harvard and Von-neuman. 1.5 Features of microcontroller.
Unit– II **Architecture of 8051 Micro-controller**	2a. Identify hardware features and internal registers with their functions 2b. Explain structure and function of I/O ports 2c. Differentiate between external and internal memory	2.1 8051 architecture 2.2 Pin diagram & description 2.3 Oscillator & clock circuit. 2.4 I/O pins & port circuits 2.5 Registers – program counter , data pointer, PSW, stack pointer, a Special function registers 2.6 Boolean Processor, Power saving options- idle and power down mode 2.7 Internal memory- RAM, ROM, RAM organization

Units	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit– III **8051 Instruction set and programming**	3a. Comprehend addressing modes and instruction set. 3b. Develop assembly language programs.	3.1 8051 Addressing modes 3.2 Classification of instructions. 3.3 Instruction set. 3.4 Assembly language programming
Unit– IV **Special Function Registers of 8051**	4a. Describe the Interrupts, timer, and related SFRs 4b. Use timers and Interrupts through programs 4c. Compare interrupts and polling method. 4d. Execute assembly language Programs.	4.1 Timer- Modes of timers/ counters TCON, TMOD 4.2 Interrupts IE,IP interrupt priority 4.3 PCON 4.4 Modes of serial communication, SMOD & SCON
Unit –V **Software development tools**	5a. Differentiate between different software development tools. 5b. Use assembler directives 5c. Develop programs using software development tool viz. Keil IDE.	5.1 Software development tools: Editor, Assembler, compiler, cross compiler, linker, debugger. 5.2 Assembler directive- ORG, DB, EQU, END, CODE, DATA 5.3. Crating various files to run 8051 Program (.asm, .obj, .lst, .abs, .hex) 5.4 Software simulator of 8051 microcontroller: Keil IDE
Unit – VI **Applications of 8051**	6a. Interface input & output devices to 8051 6b. Verify the performance of I/O devices 6c. Justify use of driver IC with stepper motor 6d. Develop a small Microcontroller based system	6.1 Interfacing of seven segment display 6.2 LCD interfacing 6.3 Keyboard interfacing 6.4 ADC/DAC interfacing 6.5 Stepper motor interfacing 6.6 Relay interfacing

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	Introduction to Microcontrollers	04	04	06	00	10
II	Architecture of 8051Microcontroller	08	02	08	02	12
III	8051 Instruction set and programming	12	02	08	08	18
IV	Special Function Registers of 8051	08	02	04	10	16
V	Software development tools	06	04	02	02	08
VI	Applications of 8051	10	00	02	14	16
	Total	**48**	**14**	**30**	**36**	**80**

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	1) Survey of Commercial microcontrollers devices available in the market	---
2	II	2) Identify ICs used on the microcontroller 8051 trainer kit, commands for various operations. 3) Use tools of Simulation software for program development	02
3	III	4) Develop program for arithmetic operation such as addition, subtraction multiplication 5) To develop program for finding smallest/ largest number and arranging numbers in ascending/descending order. 6) To find zeros and ones in a given number. 7) To transfer a block of memory	08

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
4	IV	8) Generate square wave and rectangular wave on port pin with a program	04
5	V	9) Write and execute programs for blinking of LEDs using Keil IDE 10) Write and execute programs for generation of square wave signal using Keil IDE 11) Write and execute programs for multiplication of two numbers using Keil IDE	04
6	VI	12) Interface LED and key with 8051 and making LED on/off with a key press. 13) Interface 7-segment display and design up/down counter on it with a program. 14) Interface 8 bit DAC to generate different patterns 15) Interface 8 bit ADC and develop program to convert analog data and store it. 16) Interface relay 17) Interface stepper motor	08
	VI	Micro projects: Develop small microcontroller based systems such as **1.** LED and Switch interface. **2.** DC motor interface **3.** Specific pattern generation using LED and timers **4.** 7-segment display interface **5.** LCD display interface	06
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

i. Prepare journals based on practical performed in laboratory.

ii. Solve logical problems using different software tools (ex: keil)

iii. Analyze the specifications, costs, quality and availability for various types of

microcontrollers.

iv. Simulate programs for various applications & debug.

v. Download program on microcontroller chip using flash magic software\

vi. To develop mini project.

vii. To identify use of microcontrollers in day to day applications.

viii. To identify microcontroller based solutions for social problems & challenges.

ix. Mini project

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Arrange guided visits to automation industries.
2. Motivate students to use internet and collect name, addresses, catalogues, rates, specifications of manufacturers of microcontrollers and microcontrollers based systems
3. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	8051 Microcontroller architecture programming & application.	K. J. Ayala	EEE/ Prentice Hall of India
2	The 8051 microcontroller & embedded system.	Mohmad-ali-mazidi, Janice-Gelispe-mazidi, Roline D. Mckinlay	Pearson / Prentice Hal
3	Microcontroller & its application	Ajay Deshmukh	----------

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. Development board of 8051 Microcontroller.
2. PC with required software tools (Keil IDE)

11. LEARNING WEBSITE & SOFTWARE

www.engineersgarage.com

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
CO1	Select a microcontroller for a specific application.		3	2	2									04
CO2	Interface peripherals to microcontroller.		3	3	3	3					3			08
CO3	Develop logic for assembly language programming.		3	3	3						3			12
CO4	Develop programs with serial & parallel communication		3	3	3						3			08
CO5	Develop programs using software development tool viz. Keil IDE.			3								3		06
CO6	Develop a small microcontroller systems.		3	3	3	3					3	3		10
	Total Strength		3	3	3	2					3	1		**48**

Course Curriculum Design Committee

- Dr. R.G .Wadekar , HOD, Department of Electronics and Telecommunication Engineering , G.P. Aurangabad
- Dr.S.D Yardi , Lecturer, Department of E. T., G. P. Aurangabad.
- V. G.Mahindra , Lecturer, Department of E T, G. P. Aurangabad.
- S.D.Sutawane, Lecturer, Department of E. T., G. P. Aurangabad.
- L.B.Kamkhede, Lecturer, Department of E.T., G.P. Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE : ELECTRONICS COMMUNICATION-II

COURSE CODE : 6X410

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FOURTH

1. RATIONALE

This course is introduced with the view that students are made familiar with the facts, concepts, working principles, applications & fault finding abilities in various audio, video & household electronics system. Dramatic development in HD TV, LCD & Plasma display, DC-DVD players going to affect our communication capabilities and life style in a big way.

2. COMPETENCY

Find faults in different types of audio, video and some household electronics systems.

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE@PR Internal	PA	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Experiment with different microphones, loudspeakers & select appropriate for application by examining the specification.
2. Demonstrate various stages involved in magnetic recording & reproduction of signals.
3. Demonstrate various audio systems.
4. Identify & experiment with various sections of CD-DVD players.

5. Identify & experiment with various sections of Television
6. Elaborate the functionality of T.V. transmitter & receiver.

5. DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I Microphones & Loudspeakers	1a Classify microphones 1b Demonstrate various types of microphones. 1c Classify loudspeakers 1d Demonstrate various types of loudspeakers	1.1. Microphones: Classification, characteristics. 1.2. Construction & working principle of microphones: 1.2.1 carbon. 1.2.2 Moving coil. 1.2.3 Ribbon (Velocity) 1.3. Loudspeakers: Classification & characteristics. 1.4. Construction & working principle of loudspeakers: 1.a.1 Moving coil cone type. 1.a.2 Horn type
Unit –II Magnetic Recording & Reproduction of Signals	2a Identify various processes of recording & reproduction. 2b Relate wavelength of recorded signal 2c Distinguish between gap width & frequency response. 2d Identify Relation between gap width, tape speed & frequency. 2e Select tape & tape material. 2f Demonstrate recording & reproduction unit.	2.1 Principle of magnetic recording & reproduction. 2.2 Wavelength of recorded signal. 2.3 Gap width & frequency response. 2.4 Relation between gap width, tape speed & frequency. 2.5 Choice of tape speed- Need for biasing- tape & tape material. 2.6 Record, replay & erase head. 2.7 Construction of recording & playback head. 2.8 Magnetic coating of Tape, tape transport mechanism. 2.9 Block diagram of Tape recorder, function of each block, working of record amplifier.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-III **Audio systems**	3a Differentiate mono & stereo amplifier 3bIdentify various blocks of Hi-Fi Amplifier. 3c Identify various blocks of Dolby NR recording system. 3d Identify various blocks of Public Address system	3.1 Mono & Stereo Amplifier. 3.2 Block diagram of Hi-Fi Amplifier. 3.3 Graphic equalizer: Circuit diagram & operation. 3.4 Dolby NR recording system. 3.5 Public Address system: Need & use, block diagram, requirements of PA system.
Unit - IV **CD- DVD Player**	4a Identify various materials of CD. 4b Identify various blocks of CD player mechanism. 4c Identify various blocks of DVD player.	4.1 CD Material used & size of CD. 4.2 CD player block diagram & operation. 4.3 CD Player mechanism, CD pickup assembly, gear system, drive motor, CD lens. 4.4 DVD player block diagram & working.
Unit - V **TV Fundamentals**	5a. Explore various sound, picture, transmission & scanning processes. 5b Analyze characteristics of human eye, brightness perception , photometric quantities, Aspect ratio, rectangular scanning, Persistence of vision, flicker, vertical resolution. 5c. Analyze Horizontal resolution & video bandwidth, interlaced scanning. 5d Verify CCIR-B standards	5.1 Sound & Picture transmission, scanning processes. 5.2 Characteristics of human eye, brightness perception & photometric quantities, Aspect ratio & rectangular scanning, Persistence of vision & flicker, vertical resolution. 5.3 Kell factor, Horizontal resolution & video bandwidth, interlaced scanning. 5.4 Vestigial side band transmission. 5.5 Composite video signal: Waveform, pedestal height, blanking pulse, color burst, horizontal & vertical sync pulse details, equalizing pulses, CCIR-B standard for TV. 5.6 Color theory, primary colors, secondary colors, additive & subtractive color mixing. 5.7 TV channel allocation for band-I &

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		band-III.
Unit – VI **TV Transmitter & Receiver**	6a Identify various blocks of TV camera tube: Vidicon, plumbicon, solid state camera based on CCD. 6b Identify various blocks of Monochrome TV receiver. 6c. Identify various blocks of color Receiver. 6d. Demonstrate Cable TV, MA-TV, CA- TV, CC-TV, Satellite TV network.	6.1 Introduction to TV camera tube: Vidicon, plumbicon, solid state camera based on CCD. 6.2 Block diagram of Monochrome TV transmitter. 6.3 Block diagram of Color TV transmitter. 6.4 Block diagram of Monochrome TV receiver. 6.5 Block diagram of Color TV receiver. 6.6 Probable faults & their remedies in TV receiver. 6.7 Cable TV, MA-TV, CA-TV, CC-TV, Satellite TV network.

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	Microphones & Loudspeakers	08	04	02	04	10
II	Magnetic Recording & Reproduction of Signals	08	02	06	04	12
III	Audio system	08	02	04	04	10
IV	CD- DVD Player	08	06	04	04	14
V	TV Fundamentals	04	04	08	00	12
VI	TV Transmitter & Receiver	12	04	06	12	22
	Total	**48**	**22**	**30**	**28**	**80**

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	Plot directivity pattern of Microphone	2
2		Plot directivity pattern of Loudspeaker	2
3	II	Test recording system by voltage measurement	2
4		Verify working of Tape recorder.	2
5	III	Demonstrate Hi-Fi amplifier system.	2
6		Identify various components of PA system	2
7	IV	Identify various stages of CD player.	2
8	V	Verify different stages of Monochrome TV receiver.	2
9		Observe composite video signal & measure various time intervals.	2
10		Verify various stages of Color TV receiver.	2
11		Verify CCIR-B standards of TV.	2
12	VI	Measure voltages at various test points of Monochrome TV receiver.	4
13		Demonstrate Cable TV system.	2
14		Visit TV transmitter station.	4
15		**Micro project based on contents of curriculum.**	4
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

1. Find Specifications of various audio systems.
2. Collect specifications of different color TV receiver

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Industrial Visits to TV transmitter.
2. Internet Based assignments.

3. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Principles of communication Engineering	Anokh Singh	(S Chand)
2	Radio and Television Engineering	S P Sharma	Satya prakashan
3	Television and video engineering	A M Dhake	(Tata Mcgraw- Hill)
4	Monochrome and Colour television	R R Gulati	(New Age international Ltd)
5	Consumer electronics	R G Gupta	(Tata Mcgraw- Hill)

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

a. Microphones & Loud speakers.
b. Monochrome TV receiver.
c. Public Address system.
d. CD/ DVD player system
e. Color TV receiver
f. Instruments like, CRO, RF generator, Power supply, DMM, breadboard, etc

11. LEARNING WEBSITE & SOFTWARE

a. www.nptel.iitm.ac.in
b. www.youtube.com.
c. www.howstuffworks.com
d. www.alldatasheet.com
e. Electronics Work bench

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	PSO3	No. of hours allocated in curriculum
CO1	Experiment with different microphones, loudspeakers & select appropriate for application by examining the specification.	-	3	3	3	-	-	-	-	-	-	-	-	-	10
CO2	Demonstrate various stages involved in magnetic recording & reproduction of signals.	1	3	1	1	-	-	-	-	-	-	-	-	-	12
CO3	Demonstrate various audio systems.	-	2	2	2	-	-	-	-	-	-	-	-	-	08
CO4	Identify & experiment with various sections of CD-DVD players.	-	3	3	3	-	-	-	-	-	-	-	-	-	10
CO5	Identify & experiment with various sections of Television	1	3	3	3	-	-	-	-	-	-	-	-	-	12
CO6	Elaborate the functionality of T.V. transmitter & receiver	3	2	2	2	-	-	-	-	-	-	-	-	-	12
		1	**3**	**3**	**3**	-	-	-	-	-	-	-	-	-	**64**

Course Curriculum Design Committee

- R. A. Burkul, Lecturer, Department of Electronics and Telecomm Engineering, Govt. Polytechnic, Aurangabad.

(Member Secretary PBOS) **(Chairman PBOS)**

COURSE TITLE- AUTOMOBILE ELECTRONICS-I[E]

COURSE CODE 6X414

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATIONENGINEERING	**FOURTH**

1. RATIONALE

Basic Electrical and Electronics subject learnt in the previous semester forms a pre-requisite of this course. Today majority of development in automobiles is taking place in field of automobile electrical and electronic systems. Microprocessors and Embedded systems are widely incorporated in modern vehicles. The knowledge of this subject is helpful in understanding functioning, application and maintenance of electrical and electronic circuits.

2. COMPETENCY

"Remedy automotive electrical system parts and subassemblies based on diagnosis and testing using suitable instruments and tools."

3. TEACHING AND EXAMNATION SCHEME

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

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

1. Diagnose and repair the defects in the circuits, Know circuit protection devices
2. Test the battery and identify major reasons of battery failure.
3. Identify components, operation and testing of starting and charging system.
4. Identify components of ignition system.
5. Trace lighting system and accessories in modern vehicles.
6. Apply onboard diagnosis for electronic components.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Topic 1: **Automotive Electrical and Electronic Components**	1a. Understand the purpose, operations and applications of various Automotive Electrical and Electronic Components. 1b. Apply methods to test simple circuit defects. 1c. Understand working of electrical accessories and Gauges. 1d. Diagnose and repair the defects in the circuits, Know circuit protection devices	1.1 Purpose and operation of electrical components and circuit protection devices. 1.1.1. Switches (SPST, SPDT, Ganged switch, mercury switch). 1.1.2. Relays, Solenoids, Buzzers, Resistors. 1.1.3. Fuses, Maxi fuses, Fusible links, Circuit breakers (Manual and automatic resetting types.) 1.2 Testing and repairs of circuit Defects: 1.2.1. Open circuit, Short circuit, Shorts to grounds, Voltage drop. 1.3 Working of Electromagnetic gauges and electrical accessories 1.3.1 Temp Gauges, Fuel gauge, Engine oil pressure gauge, Speedo-meter gauge 1.3.2 Washer pumps, Blower motor (only simplified wiring / block diagrams). 1.3.3 Electro chromic mirror, Power seat, Power window (only simplified wiring / block diagrams).

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Topic 2: **AutomotiveBattery**	2a. Identify components of automotive battery. 2b. Understand working and types of batteries. 2c. Apply different tests on battery and judge causes of failure. 2d. Understand battery charging. 2e. Test the battery and identify major reasons of battery failure.	2.1 Battery: Types and Testing 2.1.1 Construction and Working of following types: Lead acid battery, Maintenance free battery, Low maintenance battery, Hybrid Battery 2.1.2 Battery ratings and specifications. 2.1.3 Battery terminal test, Leakage test, Specific Gravity Test, Open circuit test, Battery drain test. 1.3 Battery charging and Jump Starting 2.2.1 Initial charging procedure, Slow, fast rate charging and trickle charging. Precautions during charging. 2.2.3. Concept of dry charged battery. 2.2.4. Jump starting-Procedure and precautions. 2.3 Factors affecting battery life and Battery failures 2.3.1. Cycle failure, internal short circuit, overcharging and sulphation. 2.3.2 Battery maintenance and safety precautions.
Topic 3: **Starting AndChargingSystem**	3a. Identify components of automotive starter and alternator. 3b. Understand working and draw labeled circuit diagram of starting system and charging system. 3c. Apply different tests on startermotor and alternator and judge reasons for failure. 3d. Know importance of output Voltage regulation.	Part A: Starting System 3.1 Construction and working of starting system. 3.2 Types of starter drive: construction and working. Bendix and overrunning clutch types only 3.3 Testing of starting system Quick testing, Current draw test, Insulated circuit resistance test (voltage drop test), Ground circuit test, No crank test, free speed test. Part B: Charging System 3.4 Construction and operation of alternator. Initial excitation and self excitation.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	3e. Operate and test starting and charging system.	3.5 Alternator testing : 3.5.a. Current output test, Field current draw test. Regulator output test, charging circuit resistance test (voltage drop test). 3.6 Alternator components testing: 3.6.1.Rotor, Stator, Internal regulator and rectifier. 3.7 Regulation : 3.7.1. Electronic, Computer Regulation circuit: layout and operation. 3.8 Operation of charge indicator light circuit with simple wiring diagram.
Topic 4 : **Ignition System**	4a. Identify components of ignition system and understand functions. 4b. Understand operation of modern ignition systems.	4.1 Conventional Ignition System: Need of ignition system, working of different components (ballast resister, ignition coil, distributor, spark plug, cords and condenser). 4.2 Electronic ignition system-Triggering of Primary circuit:Purpose, use of Transistor, Methods of triggering (magnetic pick up, Optical, Hall effect, HEI) 4.3 Electronic spark timing (EST): operation and block diagram 4.4 Computer controlled ignition system: operation and block diagram 4.5 Distributorless ignition system: operation and block diagram 4.6 Sensors: List and functions of Crankshaft Position Sensor, Camshaft Position sensor, Detonation sensor, Cylinder Identification sensor] (No construction and working)

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Topic 5: **Advanced AccessoriesFundamentals**	5a. Understand purpose and operation of advanced automotive accessories. 5b. Know latest technology andconcepts used in automobiles. 5c. Trace lighting system and accessories in modern vehicles.	5.1 Purpose and Operation of advanced accessories in modern vehicles: 5.1.1 Automatic headlight dimming. Automatic on/off headlight with time delay. 5.1.2. Keyless entry system 5.1.3 Common anti-theft system 5.1.4 Automatic door lock system. 5.1.5 Park assists system. (No circuit diagram expected for above mentioned accessories) 5.2 Introduction to microprocessor, embedded system, and GPS (block diagram only), Use andworking of fiber optics and its diagnosis.
Topic 6: **Diagnosis of Electronic Components and Systems**	6a. Apply methods to diagnose electronic sensors and actuators. 6b. Know features of OBD and OBD terms. 6c. Understand and identify troubles using malfunction indicator signal or diagnostic tester. 6d. Judge reasons of failure in electronic gauges. 6e. Apply onboard diagnosis for electronic components.	6.1 Sensor construction, working and Testing 6.1.1 Oxygen sensor, Engine coolant sensor, Intake air temperature sensor, Throttle position sensor, Manifold absolute pressure sensor. 6.1.2 Electronic fuel Injector testing (Sound test, Ohmmeter test only) 6.2 Onboard diagnosis (OBD): 6.2.1. Purpose of onboard diagnostic second generation 6.2.2 Flash codes of Malfunction indicator light. 6.2.3. OBD II Concept, terminology: Drive cycle, Trip, Warm up cycle. (Definitions only) 6.2.4 SAE J2012 standards Diagnostic Trouble Code(DTC): 5 digits only

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	**Automotive Electrical and Electronic Components**	08	10	04	00	14
II	**Automotive Battery**	09	04	08	02	14
III	**Starting And Charging System**	09	06	04	04	14
IV	**Ignition System**	07	02	06	04	12
V	**Advanced Accessories Fundamentals**	07	04	04	04	12
VI	**Diagnosis of Electronic Components and Systems**	08	04	04	06	14
		48	**30**	**30**	**20**	**80**

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	1. Test circuit defects like open, short, short to ground, voltage drop.	04
2	II	2. Test Battery - Specific gravity of electrolyte, High rate discharge test of battery. 3. Test battery for Load test, Open circuit test, Battery drain test.	04
3	III	4. Test starter motor and its circuit for voltage drop, no-load and torque. 5. Identify Components, dismantle and assemble Starter Motor. 6. Identify Components, dismantle and assemble Alternator. 7. Test Alternator- Output test, Regulated Voltage Output Test, Charging circuit resistance test. 8. Test Alternator- Electrical testing of rotor and stator of alternator	10

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
4	IV	9. Check ignition timing of a multi cylinder engine with strobe (neon light)	02
5	V	10. Inspect spark plug cords, Service spark plugs and distributor.	04
6	VI	11. Industrial Visit: Demonstration of On-board diagnosis at nearby automobile workshop with necessary facility. 12. Write assignment on the same.	04
7		**Micro project based on contents.**	04
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

1. Study and collect information of Location, construction and working of sensors and actuators. Use books, and websites. Printed data should be added to journal
2. Write symptoms, causes and remedies for Troubles of electronic gauges like.
   - Gauge reads low constantly.
   - Gauge reads high constantly.
   - Inaccurate Gauge reading

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Case studies of typical maintenance problems in different makes of automobiles and problem based learning

ii. Arrange expert lectures of maintenance executives of different automobile companies

iii. Visit of authorized workshop of two and four wheeler.

iv. Collection of animation or video clips and presentation using same.

v. Internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc.

10. SUGGESTED LEARNING RESOURCE

S. No.	Author	Title of Book	Publication
1	Jack Erjavec, Robert Scharff	Automotive Technology: A System Approach	Delmar Publisher Inc
2	Anthony ESchwaller	Motor Automotive Technology	Delmar Publisher Inc. 3rd Edition
3	Barry Hollenbe k	Automotive Electricity, Electronics and Computer Controls	Delmar Publishers
4	Jain and Astana	Automobile Engineering (6th Edition 2013)	Tata Mc-Graw Hill Publishing Co. Ltd.-New Delhi

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. Hydrometer
2. Battery load tester
3. Ignition coil tester
4. Auto electrical test bench

12. LEARNING WEBSITE & SOFTWARE

- www.how stuff works.com,
- www.educypedia.be
- www.autoshop101.com

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
CO1	Diagnose and repair the defects in the circuits, Know circuit protection devices.	3	3	3	3							3		8
CO2	Test the battery and identify major reasons of battery failure.	3	3	3	3									9
CO3	Identify components, operation and testing of starting and charging system.	3	3	3	3									9
CO4	Identify components of ignition system.	3	3	3	3									7
CO5	Trace lighting system and accessories in modern vehicles.	3	3	3	3									7
CO6	Apply onboard diagnosis for electronic components.	3	3	3	3							3		8
	Total Strength	3	3	3	3							1		**48**

Course Curriculum Design Committee

- Mr.G.G.Vaishnav,Lecturer, Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad
- Mr.S.D.Sutawane, Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE- : DIGITAL CIRCUITS & SYSTEMS [E]

COURSE CODE : 6X415

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FOURTH

1. RATIONALE

We are aware of the fact that diploma programs tend to produce sound technicians who join various industries local or global. In the era of globalization and global competition the industrial job sector is being evolving mainly digital based systems which are expanding its base in majority sectors. This course deals with the designing of the basic circuits in digital electronics. Now a day, many electronics systems are digitized & hence it is necessary to know the concept of designing of a digital circuit in combinational and sequential logic design, using medium scale integrated circuits

2. COMPETENCY

Design digital circuits and systems.

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	TH	PT	ESE(PR)@ INTERNAL	PA	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Design & experiment with combinational logic using MSI circuits.
2. Excogitate & examine encoders & decoders.
3. Outline & demonstrate the flip-flops.
4. Design & demonstrate asynchronous counters.
5. Design & demonstrate synchronous counters.
6. Relate & illustrate logic families & digital systems.

5. DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Combinational Logic Design Using MSI Circuits**	1a. Design 2-bit comparator using logic gates. 1b.Design n-bit comparator using IC 7485. 1c. Design odd/ even parity checker using 74180. 1d. Design Gray to BCD code converter using MUX IC 74153and DEMUX IC 74154. 1e. Design BCD to Gray code converter using MUX IC 74151A/ 74153/ 74157. 1f. Design one digit BCD to binary converter using 74184. 1g.Design & experiment with combinational logic using MSI circuits.	1.1 Comparator- Design of 2-bit comparator using logic gates. 1.2 Design of 8-bit/ 24bit comparator using IC 7485. 1.3 Parity Generator/ Checker- Design of 6-bit and 10-bit odd/even parity checker using 74180. 1.4 Design of parity generator circuit to add an even /an odd parity bit to a 7-bit Word /14-bit word using 74180. 1.5 Code converter- Design of Gray to BCD code converter using MUX IC 74153 and DEMUX IC 74154 . 1.6 Design of BCD to Gray code converter using MUX IC 74151A/ 74153/ 74157. 1.7 Design of one digit BCD to binary converter using 74184.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –II **Encoders and decoders**	2a. Design hexadecimal to binary priority encoder using IC 74148 and IC 74157. 2b. Design of BCD to decimal decoder driving 10 LEDS using IC 7442. 2c. Design BCD to 7-segment decoder/ driver using IC7447. 2d.Excogitate & examine encoders decoders.	2.1Decimal to Binary Priority Encoder IC 74147. 2.2 Octal to Binary Priority Encoder IC74148. 2.3 Design of hexadecimal to binary priority encoder using IC 74148 and IC 74157. 2.4 Binary to octal decoder IC 74138, BCD to Decimal decoder IC 74 LS42. 2.5 Design of BCD to decimal decoder driving 10 LEDS using IC 7442. 2.6 Design of BCD to 7-segment decoder/ driver using IC7447.
Unit-III **Flip-Flops**	3a. Design clocked flip-flop. 3b.Convert flip flop from one form to another. 3c. Outline & demonstrate the flip-flops.	3.1 Excitation table of flip-flop, clocked flip-flop design. 3.2 Edge triggered flip-flops, flip flop conversion.
Unit - IV **Asynchronous Counter Design**	4a. Design asynchronous counters using ICs 7490, 7492, 7493, 74176, 74196, 74177 and 74197 4b.Design & demonstrate asynchronous counters.	4.1 Designing of asynchronous counters using ICs 7490, 7492, 7493, 74176, 74196, 74177 and 74197. 4.2. Cascading of 7490 ICs.
Unit - V **Synchronous Counter Design**	5a. Design synchronous counters using ICs 74160, 74161, 74163 5b.Design synchronous UP/DOWN counters using IC 74168, 74169,74190, 74193. 5c.Design & demonstrate synchronous counters.	5.1 Design of MOD-N synchronous counter using JK flip-flops. Lockout condition. 5.2 Design of synchronous counters using ICs 74160, 74161, 74163. 5.3 Design of synchronous UP/DOWN counters using IC 74168,74169,74190, 74193.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – VI **Logic Families& Digital Systems**	6a. Compare logic families. 6b. Relate & illustrate logic families & digital systems.	6.1 Introduction to Bipolar & Unipolar logic families, Characteristics. 6.2 Transistor Transistor Logic- operation of TTL NAND gate, active pull-up, schottky TTL, comparison of TTL IC families. 6.3 CMOS Logic Family – CMOS Inverter, NAND, NOR gates. 6.4 Comparison of TTL and CMOS families. 6.5 Elements of digital system. 6.6 Study cases- Calculator, digital clock and frequency counter.

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	**Combinational Logic Design Using MSI Circuits**	10	04	10	04	18
II	**Encoders and decoders**	08	02	06	04	12
III	**Flip-Flops**	06	02	04	04	10
IV	**Asynchronous Counter Design**	08	02	04	06	12
V	**Synchronous Counter Design**	08	02	04	06	12
VI	**Logic Families and Digital Systems**	08	04	08	04	16
	Total	**48**	**16**	**36**	**28**	**80**

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	Build and test a two-bit comparator using logic gates.	2
2		Build and test 8-bit comparator using IC 7485.	2
3		Build and test 8-bit parity generator/checker using IC 74180	2
4		Build and test BCD to Gray code converter using IC 74153.	2
5		Build and test Gray to BCD code converter using IC 74157	2
6	II	Build and test hexadecimal to binary priority encoder using IC 74148	2
7		Build and test BCD to seven-segment decoder using IC 7447	2
8	III	Build and test clocked flip-flops.	2
9		Convert the flip-flops from one form to another	2
10	IV	Build and test MOD-N counter using IC 7490.	2
11	V	Build and test MOD-N counter using IC 74161.	2
12	V	Build and test up-down counter using IC 74169.	2
13	VI	Illustrate TTL logic Families.	2
14		Illustrate CMOS logic Families	2
15		Microprojects:	4
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1. Discuss in a group Digital systems and their design aspects.
2. Design broad features of a typical digital system concept.

SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Motivate students to Market survey for electronic products, telecom products
2. Students must be encouraged for self directed learning to improve LOs/ Cos.

ii.

9. SUGGESTED LEARNING RESOURCE

Sr. No.	Title of Book	Author	Publication
1	Modern Digital Electronics	R.P.Jain	(TMH)
2	Digital Electronics & Principal	Malvino Leach	(TMH)
3	Digital Electronics	Gothman	
4	Digital Electronics Principles & Applications	Tokheim	(TMH)
5	Digital Fundamentals	Floyd	(UBS)
6	2000 Solved Problems in DE	S.P.Bali	(TMH)
7	Digital Circuit Design	Morris Mano	(PHI)

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1:Demo kits for digital electronics.

2: ICS and bradboard

11. LEARNING WEBSITE & SOFTWARE

1:http://www.cs.northwestern.edu/~agupta/_projects/network_switch/Lectures/CombinatorialCircuitDesign/#cmsib

2:http://www.scilab.in/textbook_run/462

3: https://www.scribd.com/doc/35247264/Modern-Digital-Electronics-R-P-Jain-Solution-Manual

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
CO1	Design & experiment with combinational logic using MSI circuits.	3	3	3	3	-	-	-	-	-	-	-	-	10
CO2	Excogitate & examine encoders & decoders.	2	2	2	2	-	-	-	-	-	-	-	-	8
CO3	Outline & demonstrate the flip-flops.	2	2	2	2	-	-	-	-	-	-	-	-	6
CO4	Design & demonstrate asynchronous counters	2	2	2	2	-	-	-	-	-	-	-	-	8
CO5	Design & demonstrate synchronous counters.	2	2	2	2	-	-	-	-	-	-	-	-	8
CO6	Relate & illustrate logic families & digital systems.	2	2	2	2	-	-	-	-	-	-	-	-	8
	Total Strength	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**			**-**	**-**	**48**

Course Curriculum Design Committee

- R.M.Ingle, Lecturer, Department of Electronics & Telecommunication Engineering, Govt. Polytechnic, Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- : INDUSTRIAL INSTRUMENTATION AND CONTROL I [E]

COURSE CODE : 6X416

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**FOURTH**

1. RATIONALE

In the present industrial scenario, role of the process instrumentation is becoming more important day by day. More advanced, precise and complex instrumentations are being employed in the industry. Diploma engineers should therefore be able to identify, classify, troubleshoot and maintain the different process instrumentation systems. Therefore, this course has been designed so that students will learn to build, test and wire the different types of process instrumentation required for processing plants mainly for the process parameter such as pressure, flow, speed, humidity / moisture.

2. COMPETENCY

Operate different types of process instrumentation systems.

3. TEACHING AND EXAMNATION 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 INTERNAL**	**PA**	**150**
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Classify errors.
2. Outline various pressure measurement techniques.
3. Illustrate various transducers for flow measurement.
4. Outline speed measurement transducers.
5. Outline moisture & humidity measurement techniques.
6. Justify the need of calibration and summarize the methods of calibration.

5. DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Introduction to measurement**	1a. Define Measurement & state its types. 1b. State and explain unit system. 1c. Classify Errors. 1d. List and explain each type of error. 1e. Highlight importance of standards of measurements. 1f. List standards of measurement.	1.1 Introduction to Measurement. 1.2 Fundamental and derived units. 1.3 Error classification. 1.4 Standards of measurements.
Unit – II **Pressure Measurement Techniques**	2a. State importance of pressure measurement in process industries. 2b. Enlist and define different types of pressure. 2c. Relate different pressure measuring units. 2d. Illustrate working principle and construction for various pressure measuring devices with neat sketch with merits and demerits of each (2.4 to 2.8). 2e. List applications for pressure devices (2.4 to 2.10). 2f. Describe pressure switch with schematic diagram. 2g. Explain dead weight tester with schematic diagram. 2h. Explain Pressure Transmitter with	2.1. Pressure measurement. 2.2. Types of pressure: static, dynamic, absolute, differential, atmospheric, gauge pressure, vacuum. 2.3. Pressure units. 2.4. Manometers : U type, well type, inclined type, ring type, Float type, Barometer. 2.5. Pressure sensing elements: Bellows, Diaphragm, Bourdon Tube. 2.6. Electrical pressure sensors: LVDT type, strain gauge, Piezo electric type, Capacitance type. 2.7. Optical type Pressure Transducer. 2.8. Vacuum sensors:-Thermal Conductivity gauge, Pirani Gauge, Ionization Gauge, McLeod's gauge.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	neat schematic diagram/ block diagram.(2.11 to2.13). 2i. Outline various pressure measurement techniques.	2.9. Pressure switch. 2.10. Dead weight tester. 2.11. Pneumatic Differential pressure transmitter. 2.12. Electronic differential pressure transmitters: Capacitive and Strain Gauge type. 2.13. Smart/Intelligent Pressure Transmitter.
Unit – III **Flow Measurement Techniques**	3a. State importance of flow measurement in process industries. 3b. Define terminologies and characteristics for flow measurement (3.2) 3c. Highlight significance of Reynolds's number. 3d. Elaborate different types of Flow (Turbulent and Laminar Flow) 3e. Derive Bernoulli's theorem with flow equation for incompressible fluids. 3f. Explain pressure profile through orifice plate drawing schematic diagram. 3g. Enlist units of flow measurement. 3h. Classify flow measuring methods. 3i. Select appropriate flow meter by considering factors/ specifications. 3j. Explain detail construction for Orifice plate, flow nozzle, Venturi tube, Pitot tube. 3k. Explain working principle and construction for target flow meter. 3l. Explain working principle with construction for various flow measuring devices (3.6 to 3.13).	3.1. Introduction to flow measurement. 3.2. Flow measurement terminologies: specific gravity, density, viscosity, compressibility, effect of pressure and temperature on flow measurement. 3.3. Measurement of flow rate inclosed pipe using Bernoulli's theorem. 3.4.Turbulent and Laminar Flow, Reynolds's number. 3.5. Differential Flow sensing elements: Orifice plate, flownozzle, Venturi tube, Pitot tube,Target. 3.6. Variable area meter: Rotameter. 3.7. Magnetic flow meters 3.8. Ultrasonic flow meters. 3.9. Turbine flow meter. 3.10. Thermal flow meter. 3.11. Vortex flow meter. 3.12. Mass flow meter. 3.13. Positive displacement meters: Piston cylinder type, Nutating disc, Rotating vane. 3.14. Flow switches. 3.15.Transducers for flow measurement.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	3m. Compare various flow measuring devices. (3.5 to 3.13). 3n. List applications of flow measuring devices (3.5 to 3.13) 3o. Enlist types of venturi tube. 3p. State the rules for Installation of head flow meters. 3q. Enlist types of flow switch. 3r. Describe flow switch. 3s. Illustrate various transducers for flow measurement. 3t. Explain Differential Pressure type flow Transmitter with neat schematic diagram/ block diagram. 3u. State need of Square root extractor in flow measurement.	3.16. Flow transmitters (Pneumatic and Electronic).
Unit – IV **SPEED Measurement Techniques**	4a. Define speed with units. 4b. Classify speed measurement methods (4.2 to 4.5). 4c. List industrial application of tachometers. 4d. Outline speed measurement transducers.	4.1. Introduction to Speed measurement. 4.2. Mechanical tachometer: Revolution Counter, Resonance. 4.3. Electrical tachometer: D.C. tachometer, A. C. tachometer, Induction sensor tachometer, Magnetic tachometer (Eddy current). 4.4. Optical method: photo electric method. 4.5. Stroboscopic tachometer.
Unit – V **Moisture And Humidity** **Measurement Techniques**	5a. Define Moisture and Humidity with units. 5b. Define terminologies for humidity: relative humidity, absolute humidity, dew point, specific humidity and hygrometer. 5c. Highlight importance of moisture and	5.1. Introduction to Moisture and Humidity. 5.2. Wet and dry bulb type hygrometer. 5.3. Hair hygrometer method 5.4. Thin film capacitance type hygrometer method.

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	humidity measurement in process industries. 5d. Outline moisture & humidity measurement techniques. 5e. Explain different hygrometer with schematic diagram (5.2 to 5.6).	5.5. Electrolytic hygrometer method 5.6. Infrared absorption hygrometer method.
Unit – VI **Calibration**	6a. Define Calibration 6b. Justify the need of calibrationand summarize the methods of calibration. 6c. Differentiate various methods of calibration 6d. Describe CRO calibration process.	6.1 Introduction to calibration 6.2 Need of Calibration 6.3 Requirements of Calibration 6.4 Manual & Automated Calibration 6.5 Direct & Indirect Calibration 6.6 Calibration of CRO 6.7 Calibration of signal generator

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	Introduction to measurement	08	10	04	00	14
II	Pressure Measurement Techniques	08	04	06	04	14
III	Flow Measurement Techniques	08	02	04	08	14
IV	Speed Measurement Techniques	08	02	08	04	14
V	Moisture And Humidity easurement Techniques	08	04	06	04	14
VI	Calibration	08	6	2	2	10
		48	**28**	**30**	**22**	**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	1. Measure a given unknown pressure using U-tube Manometer. 2. Measure a given unknown pressure using Well-type Manometer. 3. Measure Pressure using C-type Bourdon Tube Pressure Gauge. 4. Measure Pressure using Bellows type Pressure Gauge. 5. Measure Pressure using Diaphragm type Pressure Gauge. 6. Test and calibrate a given pressure gauge using Dead Weight Tester. 7. Measure Pressure using LVDT type Pressure Transducer. 8. Measure Pressure using Strain Gauge type Pressure Transducer.	10
2	II	9. Measure pressure using pressure measurement techniques	02
3	III	10. Measure Flow using Orifice Plate. 11. Measure Flow using Pitot Tube.	04
4	IV	12. Measure Speed using Mechanical Tachometer. 13. Measure Speed using A.C. Tachometer. 14. Measure Speed using D. C. Tachometer. 15. Measure Speed using Magnetic Tachometer.	06
5	V	16. Measure Humidity using Hair Hygrometer. or Measure Humidity using Wet & Dry Bulb Hygrometer.	02
6	VI	17. Calibration of CRO/ multimeter/ function generator	02
7		**Microprojects:** **1.**	06
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1. Industrial Visit for students (chemical industries, petroleum industries, production industries)
2. Small technical projects based on theory topic.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Videos/Animation for different devices should be shown.
2. Seminar on relevant topics
3. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Industrial Instrumentation	D. P. Eckman	Wiley Eastern Limited
2	Industrial Instrumentation	S.K. Singh	Tata Mc Graw Hill
3	Industrial Instrumentation	K. Krishnaswamy and S. Vijayachitra,	New Age International Publication.

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

i) Function generator(sine, square, triangle etc. with frequency range 10 Hz to 100 kHz)
ii) DC power supply (-30 →0→+30 V with at least 1A current capacity)
iii) Measuring equipments like CRO (preferably dual channel, 20Mhz)
iv) Multi meter
v) Electrical tool kit.
vi) Circuit/Trainer board/ Demonstration modules of Manometers
vii) Dead Weight Tester
viii) Pressure Switches
ix) Pressure Gauges
x) Strain Gauge type Pressure Transducer
xi) Capacitance type Pressure Transducer
xii) LVDT type Pressure Transducer

xiii) Electronic differential pressure transmitters
xiv) Pneumatic Differential pressure transmitter
xv) Smart/Intelligent Pressure Transmitter
xvi) Universal Calibrator
xvii) Air Compressor
xviii) Pirani Gauge
xix) Ionisation Gauge
xx) Different types of Flow Elements like Orifice
xxi) Venturi Tube
xxii) Flow Nozzle
xxiii) Pitot tube flow trainer.
xxiv) Rotameter
xxv) Magnetic Flow Meter
xxvi) Ultrasonic Flow Meter
xxvii) Flow Trasmitters
xxviii) Flow Totalizers
xxix) Flow counter.
xxx) Flow Switches.
xxxi) Contact & Non-contact type Tachometers
xxxii) A.C. Tachometer
xxxiii) D. C. Tachometer
xxxiv) Magnetic Tachometer
xxxv) Photoelectric Tachometer
xxxvi) Stroboscopic Tachometer.
xxxvii) Hair Hygrometers
xxxviii) Wet & Dry Bulb Hygrometers.
xxxix) Electrolytic Hygrometers.
xl) Infrared Absorption Hygrometer.

11. LEARNING WEBSITE & SOFTWARE

i. http://en.wikipedia.org/wiki/Pressure_measurement
ii. http://www.ni.com/white-paper/13034/en/
iii. http://www.omega.com/literature/transactions/volume3/pressure.html
iv. http://en.wikipedia.org/wiki/Flow_measurement
v. http://www.pc-education.mcmaster.ca/Instrumentation/flow.htm

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
CO1	Classify errors.	3	3	1	1	-	-	-	-	-	-	-	-	8
CO2	Outline various pressure measurement techniques.	3	3	1	1	-	-	-	-	-	-	-	-	8
CO3	Illustrate various transducers for flow measurement.	3	3	0	0	-	-	-	-	-	-	-	-	8
CO4	Outline speed measurement transducers.	3	3	1	1	-	-	-	-	-	-	-	-	8
CO5	Outline moisture & humidity measurement techniques.	3	3	1	1	-	-	-	-	-	-	-	-	8
CO6	Justify the need of calibration and summarize the methods of calibration.	3	3	1	1	-	-	-	-	-	-	-	-	8
	Course Strength	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**48**

Course Curriculum Design Committee

- Mr. G.G. Vaishnav, Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad
- Mrs. L.B. Kamkhede, Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- INDUSTRIAL AUTOMATION & CONTROL-I[E]

COURSE CODE 6X417

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**FOURTH**

1. RATIONALE

This course is very important for students who want to use their skills of designing, programming and testing electronic circuits in industrial automation sector. The aim of this course is to introduce students with present Industrial Automation scenario in India. The salient points of essential component of present industrial automation industry are covered in this course.

2. COMPETENCY

Maintain electronic circuitry of industrial automation systems.

3. TEACHING AND EXAMNATION 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) @ INTERNAL**	**PA**	**150**
3	-	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Classify the instrumentation system & outline the concept of signal conditioning
2. Classify various physical parameters & demonstrate measurement techniques for it.
3. Elaborate hydraulics systems & demonstrate various components involved in hydraulic systems.
5. Elaborate pneumatic systems & demonstrate various components involved in pneumatic systems
6. Interface Computer aided control systems & experiment with data acquisition system
7. Interface PLC with SCADA & experiment with it for specific application.

5 .DETAILED COURSE CONTENTS

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I **Introduction to Instrumentation**	1a. Describe different elements of instrumentation system with examples 1b. Classify the instrumentation systems. 1c. With sketches describe various types of standard instrumentation signals 1d. Justify the need of signal conditioning	1.1 Elements of instrumentation system including process and biomedical instrumentation i. Null and Deflection ii. Control and Monitoring iii. Analog and Digital 1.2 Standard instrumentation signals: Pneumatic, Current loop, 0-10volts. 1.3 Signal conditioning: DC signal and AC signal conditioning.
Unit– II **Measurement of Physical Parameters**	2a. Describe measurement techniques of physical parameters like torque, length, speed, level. 2b. Explain working of magnetic flow meter 2c. Experiment with different types of pressure measurement techniques 2d. Classify temperature measurement techniques 2e. Compare working of different types of pyrometers	2.1 Measurement techniques i. Measurement of torque ii. Measurement of length iii. Measurement methods of level measurement: Laser, Microwave, Optical, Ultrasonic, Eddy current. 2.2 Magnetic flow meter 2.3 Pressure measurement techniques by

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	2f. Explain working of various types of position sensors 2g. Select measurement techniques to measure humidity and moisture 2h. Outline working principle of Magneto-strictive, Hall effect, Ionization and Electrochemical Transducers	i. Strain gauge, ii. Potentiometer, iii. Pressure switch 2.4 High and low temperature measurement i Radiation type pyrometer ii. Optical type pyrometer 2.5 Position sensor i. Resistive type ii. Optical type iii. Inductive type 2.6 Measurement of moisture and humidity 2.7 Special types of transducers: i. Magneto-strictive transducers ii. Hall effect Transducers iii. Ionization Transducers iv. Electrochemical Transducers
Unit– III **Hydraulic systems,pneumatic systems andactuators**	3a. Differentiate between pneumatic and hydraulic systems. 3b. Explain Pneumatic, Hydraulic and electro-pneumatic actuators. 3c. Outline working principle of various mechanical actuating systems	3.1 Hydraulic systems: Physical components of hydraulic systems: Hydraulic pumps, filters and Pressure regulation 3.2 Pneumatic systems: Air compressors, filters and regulators, Air treatment 3.3 Actuators :Principle of operation of Linear actuators (single acting cylinder, double acting cylinder) Rotary actuators(rotating vane, gear type) and direction Control valves (Poppet valve, spool valve) 3.4 Electric actuators Stepper motor, DC motor, Solenoid valves, Relays (Principle of operation and

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		application 3.5 Mechanical Actuating Systems. Cams, Gear, Belt , Rack and Pinion and Bearings (Principle of operation, types, and application)
Unit– IV **Computer Aided Control Systems**	4a. State the application of computers in process control. 4b. Explain at the block diagram level the different elements of computer based control systems. 4c. Interpret function of various blocks of CNC machine. 4d. Inspect the use of different computer interfaces to connect various electronic devices. 4e. Highlight important features of Data acquisition systems. 4f. Elaborate the concept of virtual instrumentation.	4.1 Role of computer in process control 4.2 Block diagram of the computer based control 4.3 CNC machine, various blocks of CNC machine 4.4 Standard interfaces: RS-232,RS-422A,RS-485,GPIB 4.5 Data acquisition system. 4.6 Virtual Instrumentation: Conventional and Graphical Programming.
Unit– V **Introduction to SCADA and PLC**	5a. Highlight importance of SCADA. 5b. Highlight importance of PLC. 5c. Describe SCADA communication technologies,monitoring and supervisory functions. 5d. Identify various blocks of PLC. 5e. Interface PLC to SCADA.	5.1 SCADA: Data acquisition system, evaluation of SCADA 5.2 communication technologies, monitoring and supervisory functions. 5.3 PLC: Block diagram, programming languages, Ladder diagram, Functional block diagram, Applications, Interfacing of PLC to SCADA.

8. 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	**Introduction to Instrumentation.**	08	04	02	02	08
II	**Measurement of Physical Parameters.**	12	10	04	06	20
III	**Hydraulic systems, pneumatic systems and actuators.**	10	04	08	08	20
IV	**Computer Aided Control Systems.**	10	04	04	08	16
V	**Introduction to SCADA and PLC.**	08	02	06	08	16
		48	**24**	**24**	**32**	**80**

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

9. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1. Analyze standard instrumentation signals waveforms.	4
2	II	2. Test the performance of Potentiometer type pressure Measurement. 3. Measure torque using strain gauge. 4. Measure Resistive type Position sensor . 5. Measure temperature using radiation/optical pyrometer. 6. Measure pressure using strain gauge. 7. Measure water level using resistive transducer. 8. Measure water level using capacitive transducer. 9. Measure water Level using ultrasonic transducer.	16
3	III	10. Demonstrate & observe working of Hydraulic system (any one) 11. Demonstrate & observe working of pneumatic system. (any one).	4
4	IV	12. Demonstrate & observe working of CNC system (any one)	4
5	V	13. Demonstrate & observe working of PLC with SCADA (any one)	4
		Micro-projects: [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. Testing of Electronic kit/ Circuit using Multimeters	
Total			32

10. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

1) Visit the website to understand animated functioning of instrumentation systems.
2) Identify the hydraulic & pneumatic systems & analyze the function of it.
3) Write the codes for various CNC systems.

Interface & perform specific application of PLC with SCADA.

11. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

Students must be encouraged for self directed learning to improve LOs/ Cos.

12. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Industrial instrumentation and control	Singh, S.K.	TATA McGraw-Hill, New Delhi (Latest Edition)
2	Introduction to Instrumentation and Control	Ghosh, A. K.	PHI Learning, New Delhi (Latest Edition)
3	Electronic measurement & Instrumentation systems	Jones, Larry, Chin, A foster	Prentice Hall International Edition
4	Transducers and Instrumentation	D. V. S. Murthy	PHI Learning, New Delhi (Latest Edition)
5	K. P. Ramachandran, G. K. Vijayaraghavan, M. S. Balasundaram	Mechatronics - Integrated Mechanical electronic systems	Wiley-India
6	Computer-Based Industrial Control	Kant, Krishna	PHI Learning, New Delhi (Latest Edition)

13. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED

1.Instrumentation and control trainer kits.
2. Potentiometer type pressure Measurement kit.
3. Resistive type Position sensor kit
4. Radiation/optical pyrometer temperature measurement kit.
5. Pressure measurement using strain gauge kit.
6. Level measurement using resistive transducer kit.
7. Level measurement using capacitive transducer kit
8. Level measurement using ultrasonic transducer kit.
9. Hydraulic system.
10.Pneumatic system.
11.CNC system.
12.PLC with SCADA system.

14. LEARNING WEBSITE & SOFTWARE

www.google.com

www.youtube.com

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
CO1	Classify the instrumentation system & outline the concept of signal conditioning	2	3	1	3	-	-	-	-	-	-	-	-	**8**
CO2	Classify various physical parameters & demonstrate measurement techniques for it.	3	3	3	3	-	-	-	-	-	-	-	3	**12**
CO3	Elaborate hydraulics systems & demonstrate various components involved in hydraulic systems.	1	1	1	1	-	-	-	-	-	-	-	-	**5**
CO4	Elaborate pneumatic systems & demonstrate various components involved in pneumatic systems.	1	1	1	1	-	-	-	-	-	-	-	-	**5**
CO5	Interface Computer aided control systems & experiment with data acquisition system	2	3	2	2	-	-	-	-	-	-	-	-	**10**
CO6	Interface PLC with SCADA & experiment with it for specific application.	2	2	2	2	-	-	-	-	-	-	-	-	**8**
		2	**3**	**2**	**2**								**1**	**48**

Course Curriculum Design Committee

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- S.D.Sutawane, Lecturer , Department of Electronics and Telecommunication Engineering, Government Polytechnic , Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

GOVERNMENT POLYTECHNIC, AURANGABAD (An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre [6th Revision : Outcome Based Education -2017-18]

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

FIFTH Semester Courses

Sr. No.	SEM	Course code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)								
				Theory (TH)	Practical (PR)	Tutorial (TU)	Total Credit (C)	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Practical Exam Hours	Remarks
1	V	6X411	Microwave & Satellite Communication	3	2	–	5	20	80	--	25#	25	150	3	2	
2	V	6X404	Control Systems & PLC	3	2	–	5	20	80	--	25#	25	150	3	2	
3	V	6X401	Electronics Circuit Design	3	2	–	5	20	80	--	25#	25	150	3	2	
4	V	6X407	Digital Communication	3	2	–	5	20	80	25#	--	25	150	3	2	
5	V	6X412	Computer Hardware & Networking	2	2	–	4	--	--	50#	--	50	100	--	2	
6	V	6X501	Project –I [Seminar]	0	2	–	2	--	--	--	25#	50	75	--	2	
		ANY ONE FROM GROUP ELECTIVE -II														
A	V	6X506	Automobile Electronics –II	3	2	–	5	20	80	25@	–	25	150	3	2	
B	V	6X507	Automation & Control -II	3	2	–	5	20	80	25@	–	25	150	3	2	
C	V	6X508	Advance Micro-Controller	3	2	–	5	20	80	25@	–	25	150	3	2	
D	V	6X509	Instrumentation & Control - II	3	2		5	20	80	25@		25	150	3	2	
In plant training of 2/3/4 weeks between 4th and 5th semester [Summer vacation]:Report submission [PA] during 5th semester ESE [OR] [Internal]																
8	V	6X503	In-Plant Training	0	0	0	4		--	--	50#	50	100			
		TOTAL		**35 [17+18]**			**35**	**100**	**400**	**175**	**75**	**275**	**1025**			

Legends : TH-Lecture; TU-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

HOD Electronics and Telecomm Engineering

Govt. Polytechnic, Aurangabad.

COURSE TITLE:MICROWAVE AND SATELLITE COMMUNICATION
COURSE CODE:6X411

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

This course contains all the important features of microwave communication & its applications. Being the era of technology, students should get exposure to latest satellite communication n. This works as the base of all advanced communication system.

2. COMPETENCY

Analyze RADAR,Satellite & Cellular concepts.

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 EXTERNAL**	**PA**	**150**
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2		

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

4. COURSE OUTCOMES (COs)

1. Outline microwave communication and relate various components involved in microwave link.
2. Outline cellular communication and illustrate, demonstrate GSM.
3. Outline satellite communication.
4. Justify Satellite system link model and discuss multiple access techniques.
5. Outline the concepts of RADAR and estimate the range of target.
6. Interpret various applications and emerging technologies in wireless communication.

5. COURSE DETAILS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit – I **Microwave Communication**	1a. Outline microwave communication and Identify various parts and devices in a microwave link. 1b. Describe various microwave waveguides. 1c. Describe the operation of microwave devices.	1.1 History, microwave frequency bands, advantages & applications. 1.2 Types of waveguides, propagation of wave in rectangular & circular waveguides. 1.3 TE & TM modes, excitation of modes. 1.4 Cutoff frequency, guide wavelength, group & phase velocity. 1.5 Passive devices: Waveguide coupling, multiple junctions, directional coupler,Isolator,circulator. 1.6 Active Devices : Klystron, reflex klystron,TWT,IMPATT & TUNNEL diodes.
Unit – II **Cellular Communication**	2a. Describe various terms & concepts of cellular communication. 2b. Draw a layout of GSM architecture. 2c. Describe GSM services. 2d. Outline cellular communication and illustrate, demonstrate GSM.	2.1 The cellular concept. 2.2 Frequency bands & cellular coverage. 2.3 Geometry of a cell: cell size & number of possible users. 2.4 Frequency reuse, handoff, cell splitting, sectorizing, micro cell concept. 2.5 cellular architecture. 2.6 Digital cellular system : GSM 2.6.1 advantages and limitations 2.6.2 GSM features, services 2.6.3 GSM Architecture. 2.7 Features of third generation cellular service.
Unit – III **Satellite Communication**	3a. Describe various terms in satellite communication. 3b. Explain the block diagram of satellite communication. 3c. Draw the block diagram of satellite earth station.	3.1 Advantages & disadvantages of satellite system. 3.2 Frequency bands, uplink & downlink frequencies. 3.3 Satellite basics: orbits,altitude, footprint.

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
	3d. Outline satellite Communication 3e. Justify Satellite system link model and discuss multiple access techniques.	3.4 Satellite orbits. 3.5 Satellite system link model: uplink,transponder, downlink, crosslink. 3.6 Block diagram of satellite earth station. 3.7 Block diagram of satellite & Communication transponder. 3.8 Satellite multiple access: FDMA,TDMA,CDMA. 3.9 Satellite subsystems.
Unit – IV **RADAR**	4a. Describe the phenomenon of RADAR. 4b. Classify the different types of RADAR. 4c. Explain block diagram of RADAR. 4d. Describe RADAR communication system with its advantages, disadvantages & applications. 4e. Outline the concepts of RADAR and estimate the range of target.	4.1 Basic RADAR system & applications. 4.2 Frequencies & powers used in RADAR. 4.3 Definition of range, pulse width, PRF, duty cycle. 4.4 RADAR range equation and factors affecting range. 4.5 Scanning methods, search & track RADAR system. 4.6 Display methods, PPI. 4.7 Basic pulsed RADAR system. 4.8 MTI & CW Doppler radar.
Unit- V **Applications& e merging trends in technology**	5a. Describe the operation of GPS 5b. Describe the concept of satellite phone & VOIP 5c. Explain the use of Wi-Max 5d. Differentiate smart antenna from ordinary antenna. 5e.Interpret various applications and emerging technologies in wireless communication	5.1 GPS 5.2 Satellite Phone 5.3 DTH. 5.4 IP TV, VOIP. 5.5 Bluetooth, zigbee. 5.6 Wi-Fi, Wi-max 5.7 GPRS. 5.8 Smart Antenna.

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	**Microwave Communication**	10	10	6	2	18
II	**Cellular Communication**	08	10	6	2	18
III	**Satellite Communication**	12	8	6	2	16
IV	**RADAR**	10	8	6	2	16
V	**Applications & emerging trends in technology**	08	4	4	4	12
		48	**40**	**28**	**12**	**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 slight from above table.

7. SUGGESTED EXERCISES/PRACTICALS

Sr. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	1. Install a microwave Bench 2. Study various microwave components. 3. Measure Microwave frequency 4. Verify properties of directional coupler 5. Verify klystron characteristics.	08
2	II	1.Verify GSM air interface including forward and reverse frequency. 2. Understand & verify the modulation used in GSM 3. Practically verify: call setup, call forward, call divert, call termination. 4.Illustrate GSM operations for complete incoming and outgoing call. 5. Illustrate concept of handoff.	08
3	III	1.Outline block schematic of transponder. 2. Highlight important features and working principle of Earth station.	04

4	IV	1. Highlight important features and working principle of RADAR. 2. Illustrate RADAR application.	04
5	V	1. Install DTH system. 2. Verify VOIP.	04
6		**Micro project based on content of curriculum.**	04
	Total		32

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1. Visit nearby satellite earth station.
2. Hands on training on mobile trainer & GSM Trainer.
3. Arrange visit to any cellular base station.
4. Collect information of advanced trends in communication technologies.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

a. Lectures cum discussion using Chart, Cut Section, and Display board.

b. Use of animations, video or power point presentation.

c. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCES A) Books

S. No.	Title of Books	Author	Publication
1	Microwave & radar	Sanjeev Gupta	Satya prakashan
2	Microwave Devices	Samuel Lio	
3	Microwave & Radar	M.Kulkurni	
4	Satellite Communication	Gangliardi	CBS publication
5	Mobile & Cellular Communication	Raj Pandya	
6	Mobile Communication	T.S.Rappaport	
7	Electronic communication systems	George Kennedy	5 e - Mc Graw Hill

A) Major Equipment/ Instrument with Broad Specifications

1. Mobile Handset trainer kit
2. GSM trainer kit
3. CRO & DSO
4. RADAR trainer kit
5. Microwave workbench

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	Outline microwave communication and relate various components involved in microwave link.	3	3	3	3	-	-	-	-	-	-	-	-	10
CO2	Outline cellular communication and illustrate, demonstrate GSM.	3	3	1	1	-	-	-	-	-	-	-	-	08
CO3	Outline satellite communication	3	3	-	-	-	-	-	-	-	-	-	-	12
CO4	Justify Satellite system link model and discuss multiple access techniques.	3	3	-	-	-	-	-	-	-	-	-	-	10
CO5	Outline the concepts of RADAR and estimate the range of target.	3	3	-	-	-	-	-	-	-	-	-	-	08
CO6	Discuss and interpret various applications and emerging technologies in wireless communication	2	2	1	1	-	-	-	-	-	-	-	-	10
		3	**3**	**1**	**1**	-	-	-	-	-	-	-	-	**48**

COURSE CURRICULUM DEVELOPMENT COMMITTEE

G.G.Vaishnav,Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad.

Dr.R.G.Wadekar, Head, Department of Electronics and Telecommunication Engineering,Government Polytechnic, Aurangabad.

R.A.Burkul, Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad.

HOD ET Program Co-ordinator(CDIC)

COURSE TITLE: CONTROL SYSTEMS & PLC

COURSE CODE: 6X404

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

The advancement of both knowledge and technique has resulted in the development of controls in process industry. The progression of human existence from a primitive state to the present complex technological world was paced by learning new and improved methods to control the environment. Control means methods to force parameters in the environment to have specific values, like varying the room temperature to examine elements of control system. This course is beneficial for process control variation in any process control industry which equips the student for maintenance and quality analysis.

2. COMPETENCY

Analyze control action, response of control system and stability of control system for Process Application.

3. TEACHING AND EXAMNATION 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) # (External))	PA	
3	0	2	5	80	20	25	25	150
	Exam Hours			3	1	2	--	

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

I Recall & relate control system.

II Apply Feedback control and transfer function.

III Analyze the response of the system.

IV Analyze the stability of system.
V Prioritize control actions & select specific process controllers.
VI Elaborate PLC systems.

5 .DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Overview of Control system**	1a. Recall and relate Plant, Process, System, Control system, Servo system, Open loop control system, closed loop control system. 1b. Classify types of control system. 1c. Explain open loop control system with block diagram and example. 1d. Explain closed loop with block diagram and example. 1e. Compare open loop and closed loop system. 1f. Apply feedback control and transfer function.	1.1 System- definition & practical example. Control system: definition and practical example. Open loop & closed loop systems definition, block diagram, practical example, and Comparison. 1.2 Laplace transform: Significance in Control System, Linear time varying and time invariant systems: definition, developing differential equations of R-C and R-L-C electric circuits. 1.3 Transfer function: definition, derivation of transfer function for close loop control system. 1.4 Order of a system: definition, 0, 1, 2 order system standard equation, practical examples. 1.5 Block diagram representation of a system- need, reduction rules, problems. 1.6 Signal flow graph- need, reduction rules, problems.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– II **Analysis of control system**	2a. List and draw Standard test signals. 2b. Explain Standard test signals with their equations. 2c. Illustrate time response, transient response, steady state response. 2d. Illustrate characteristic equation, order of the system and type of the system. 2e. Explain time response of 1storder system with unit step input. 2f. Explain time response of 2nd order system with unit step input. 2g. Draw time response of second order system with unit step input and define following terms: delay time td, rise time tr, peak time tp, maximum overshoot Mp, settling time ts. 2h. Describe steady state error and Error constant of control system for step ramp, parabolic input and type-0, 1, 2 systems. 2i. Analyze response of system.	2.1 Dynamic analysis of measurement systems definition, time domain and frequency domain analysis. 2.2 Time domain analysis: Transient and steady state response, steady state error. 2.3 Standard test inputs: step, ramp, parabolic& impulse. Need of them, significance and corresponding Laplace representation. 2.4 Poles & zeros – definition. 2.5 Analysis of first order control system for unit step input; concept of time constant 2.6 Time response specifications (no derivations); problems on time response specifications

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– III **Stability analysis**	3a. Describe concept of stability. 3b. Classify Control system Stability according to location of the roots of characteristic equation (poles of the system) 3c. State necessary conditions for Stabily 3d. State Routh-Hurwitz Criteria for stability. 3e. Determine stability of given characteristic equation using Routh-Hurwitz Criteria. 3f. Describe concept of root locus in brief.	3.1 S-plane: Introduction 3.2 Stability: stable, unstable, critically stable & conditionally stable system; relative stability; Root locations in S-plane for stable and unstable systems 3.3 Routh's stability criterion- different cases & conditions (statement method); problems (Time response analysis) 3.4 Introduction, advantages & disadvantages of frequency response analysis; frequency response specifications 3.5 Root Locus techniques.
Unit– IV **Control actions & process controllers**	4a. Highlight important Process elements. 4b. Classify modes of control action. 4c. Explain two positions, Multi position, P, I, D and composite mode control action. 4d. Prioritize control actions & select specific process controllers.	4.1 Process control system: block diagram, elements. 4.2 Role of controllers in process industry; concept of sequencing & modulating controllers. 4.3 Control actions: discontinuous & continuous modes. 4.4 On off controllers: neutral zone 4.5 Proportional controllers (offset, proportional band) integral & derivative controllers. 4.6 Composite controllers; PI, PD, PID controllers.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –5 **PLC Overview**	1a. Outline the concept of PLC. 1b. Describe principle of operation of PLC 1c. Differentiate between PLC and computer controlled systems 1d. Describe hardware components of PLC. 1e. Explain the block diagram of PLC. 1f. Explain Ladder diagram	1.1 Principles of operation of PLC, Block diagram. 1.2 PLC verses computer. 1.3 PLC hardware components. 1.4 Scan time of a cycle. 1.5 Industrial PLC. 1.6 Concept of Ladder diagram with examples of AND, OR, NOT, NAND & NOR gates 1.7 Application of PLCs.

5. 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	**Overview of Control system**	8	09	09	00	18
II	**Analysis of control system**	10	02	10	04	16
III	**Stability analysis**	10	02	08	08	18
IV	**Control actions & process controllers.**	10	02	04	10	16
V	**PLC Overview**	10	00	02	10	12
	Total	**48**	**15**	**33**	**32**	**80**

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1) Write Program to build Transfer Function (T.F) Object in polynomial ZPK & Plot their responses. 2) Test & Observe Step response of first order R-C circuit. 3) Test & Observe Step response of R-L-C second order circuit.	08
2	II	4) Find poles and impulse response of the T.F.	04
3	III	5) Find Root locus for a system with Real poles.	04
4	IV	6) Test Temperature controller with on-off controller. 7) Test Temperature controller with PI controller. 8) Test Temperature controller with PID controller	06
5	V	9) Build basic logic gates using ladder diagram with help of PLC. 10) Build Universal logic gates using ladder diagram with help of PLC.	06
6		**Micro project using PLC**	04
Total			**32**

7. SUGGESTED STUDENTS ACTIVITIES

a. Do analysis of First & Second Order Control System using various free control simulators.

b. Develop simple program for different control actions.
c. Use Internet Surfing relevant to Automation & Control Systems.
d. Prepare Presentation on given topics.

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

a. Visit to Industries.
b. Use Free Simulators Software for teaching / learning activities.
c. Show Video/Animation Films relevant to Automation & Control System.
d. Students must be encouraged for self directed learning to improve LOs/ Cos.

SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Digital Control System	M.Gopal	Tata McGraw-Hill
2	Control system	I.J.Nagrath & Gopal	Tata McGraw-Hill
3	Control System	M. Gopal	Tata McGraw-Hill
4	Modern control system	K. Ogata	PHI
5	Control systems	Kumar	(Tata McGraw-Hill)
6	Programmable logic Controllers Principles and applications	John w. Webb Ronald A Reis	PHI Learning

9. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :--

a. Process Control Trainer

b. Process control simulator

c. PLC Trainer.

10. LEARNING WEBSITE & SOFTWARE

MATLAB

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
CO1	Recall & relate control system.	1	1	1	1	-	-	-	-	-	-	-	-	4
CO2	Apply Feedback control and transfer function.	1	1	1	1	-	-	-	-	-	-	-	-	4
CO3	Analyze the response of the system.	3	3	3	3	-	-	-	-	-	-	-	-	10
CO4	Analyze the stability of system.	3	3	3	3	-	-	-	-	-	-	-	-	10
CO5	Prioritize control actions & select specific process controllers.	3	3	3	3	-	-	-	-	-	-	-	-	10
CO6	Elaborate PLC system	3	3	3	3	-	-	-	-	-	-	-	-	10
COURSE		**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**48**

Course Curriculum Design Committee

- Dr. R . G. Wadekar, HOD, Department of Electronics and Telecomm Engineering, Govt. Polytechnic, Aurangabad
- Dr. S. B. Dhoot, Department of Electronics and Telecomm Engineering, GPA

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE ELECTRONICS CIRCUIT DESIGN

COURSE CODE 6X401

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

It is vital for any Electronics and telecommunication Diploma in Engineering to expose the students to design of commonly used application oriented electronic circuits. This course will help the students to experiment with design, construction, testing, working, of various types of power supplies, amplifiers, oscillators. This course is therefore designed so that the diploma engineers will be able to use their skill in assembling, testing electronics gadgets etc. These skills will set in motion their ability to test and troubleshoot the electronic circuits and gadgets.

2. COMPETENCY

Assemble the electronic circuits.

Apply the techniques in designing basic IC based power supply, multivibrator, oscillator, amplifier circuits.

3. TEACHING AND EXAMNATION 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) # EXTERNAL	PA	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Design regulated and unregulated power supplies with filter & test the performance.
2. Design Astable/ Monostable multivibrator using IC 555 & test the performance.
3. Design oscillator circuit using IC 741.
4. Design Audio power amplifier using IC
5. Design function generator using 8038.
6. Maintain electronic gadgets used in various domestic and industrial applications.

5. DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Introduction**	1a Identify specifications and values of Resistance, capacitor & Inductor using color codes and semiconductor devices using codes. . 1b Design HWR, FWR & Bridge rectifier with C & L filter & their design equations	1.1 Specifications of Electronics components: Resistor, Inductor, Capacitor, Color coding, Coding of semiconductor devices. 1.2 Design of Half wave, Full wave. Bridge rectifier circuit with Capacitor Filter.
Unit –II **Design of Regulated Power supply**	2a Specify zener diode for shunt regulator 2b Design positive/Negative fixed voltage & variable voltage regulator using IC 78XX, LM 317, LM337 and IC 723	2.1 Design of Zener diode shunt regulator 2.2 Design power supply using IC 78xx/ 79xx series regulator. 2.3 Design of power supply using LM 317, LM 337. Dual tracking regulator using LM 317 and LM 337 2.4 IC 723 Low voltage / High voltage regulator design.
Unit –III **Design of Small signal Amplifiers**	3a. Design biasing circuits like fixed bias, collector to base bias & voltage divider bias. 3b. Design Single stage CE amplifier. 3c. Design of emitter follower circuit	3.1 Types of Transistor configuration. 3.2 Design of Biasing circuits: Fixed bias, collector to base bias & voltage divider bias. 3.3 Design of single stage CE amplifier. 3.4 Design of emitter follower circuit (CC configuration)[**without "H"**

`	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		parameters
Unit-IV **Design of Oscillators**	4a. Design oscillator using IC 741 (Phase shift, Wein bridge, & Colpitt's oscillator). 4b Design Crystal oscillator using Transistor & UJT oscillator.	4.1 Phase shift oscillator, Wein Bridge oscillator Colpitt's oscillator using Op-Amp-741 4.2 Crystal oscillator using Transistor 4.3 UJT Relaxation oscillator
Unit – V **Design of Pulse & Function Generator Circuit**	5a. Design Astable, Monostable multivibrator using IC555. 5b. Design of Schmitt's trigger Using IC555. 5c. Design function generator using IC 8038.	5.1 Design of Astable Multivibrator, 5.2 Design of Monostable Multivibrator 5.3 Designs of Schmitt's trigger (All designs using 555), 5.6 Design of function generator using IC 8038.
Unit - VI Design of Special Purpose Circuits	6a Design Active tone control circuit using LM833(Bass & Treble control) 6b Design Graphic equalizer (5-band) using LM 833. 6c Design Audio power amplifier Using LM380/TBA 810. 6d Design DVM using IC 7106/7107	6.1 Design of Tone control circuit (Bass Control, Treble control, Active tone control). 6.2 Design of graphic equalizer (5 Band) 6.3 Design of Audio power amplifier using LM 380 / TBA 810 6.4 Design of DVM using IC 7106/7107

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	Introduction	04	03	03	04	10
II	Design of Regulated power supply.	10	04	04	08	16
III	Design of Small signal Amplifiers	08	02	02	06	10
IV	Design of Oscillators	06	02	04	08	14
V	Design of Pulse & Function Gen. circuits	10	02	04	10	16
VI	Design of Special purpose circuits	10	02	04	08	14
	Total	**48**	**15**	**21**	**44**	**80**

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

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	Unit No.	Tutorial / Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1. Design of Half wave rectifier with C-filter. 2. Design of Centre Tap Full wave rectifier & Bridge rectifier with C-filter.	8
2	II	Design of Zener shunt regulator	4
3	III	Design of Positive/ Negative voltage regulator using 78XX/ 79XX series.	4
4	IV	Design of Positive/ Negative voltage regulator using LM 317/ LM 337.	4
5	V	Design of Positive fixed & Variable voltage regulator using IC 723.	8
6	VI	1.Design Audio power amplifier using LM380/ TBA 810. 2.Design DVM using IC 7106/7107	4
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

i. Find Specifications and package of Resistor, capacitor, Inductor, Diode, Transistor from datasheet.
ii. Assignments on solving design numerical.
- Power supply design using IC 78xx, 79xx, LM 317, LM 723 etc
- Oscillator design using ICs
- Astable/ Monostable design using IC 555.

9. SUGGESTED LEARNING RESOURCE

Sr. No.	Title of Book	Author	Publication
1	Electronics Circuit design	Prof. S.N.Talwar/ Dr.T.R.Sontakke	-------

Sr. No.	Title of Book	Author	Publication
2	Electronics design Principles	Goyel & Khetan	Khanna Publications.
3	Electronics Devices & Circuits	David Bell	THM Edition

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :--

Instruments Like:

CRO, Function Generator, Power supply, and Digital Multimeter etc.

11. LEARNING WEBSITE & SOFTWARE

a. www.nptel.iitm.ac.in
b. www.youtube.com. (lectures on Power electronics)
c. www.howstuffworks.com
d. www.alldatasheet.com
e. Electronics Work bench

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
CO1	Design regulated and unregulated power supplies with filter & test the performance.	-	3	3	3	-	-	-	-	-	-	-	-	10
CO2	Design oscillator circuit using IC741	-	3	3	3	-	-	-	-	-	-	-	-	08
CO3	Design Astable/ Monostable multivibrator using IC 555 & test the performance.	-	3	3	3	-	-	-	-	-	-	-	-	10
CO4	Design function generator using 8038.	-	3	3	3	-	-	-	-	-	-	-	-	04
CO5	Design Audio power amplifier using IC	-	3	3	3	-	-	-	-	-	-	-	-	10
CO6	Maintain electronic gadgets used in various domestic and industrial applications.	-	3	3	3	-	-	-	-	-	-	-	-	06
	Total Strength	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**48**

Course Curriculum Design Committee

Dr. S. B. Dhoot, Lecturer, Department of Electronics and Telecomm Engineering, Govt. Polytechnic, Aurangabad.

S.D. Nimbekar, Lecturer, Department of Electronics and Telecomm, Govt. Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)

COURSE TITLE DIGITAL COMMUNICATION

COURSE CODE 6X407

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

Communication technologies have undergone radical changes, especially due to convergence of computers and communication. Digital communication offers data processing option and flexibility which is not available with analog communication. This course will enable the student to comprehend facts, concept and working principles of Digital communication systems. It familiarizes the student with digital information theory, information rate and channel capacity. This course helps the students to understand the concept of principles of digital modulation technique, channel coding method and error control, Multiple Access scheme and spread spectrum modulation. The knowledge acquired by student will help them to apply in various modern communication systems

2. COMPETENCY

Analyze importance of various blocks of a Digital communication system.

3. TEACHING AND EXAMNATION 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)# EXTERNAL	PA	150
3	-	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

I. Identify importance of various blocks of Digital Communication.
II. Compare analog pulse modulation with digital pulse modulation.
III. Apply various coding, error detection and error correction methods.
IV. Classify various digital modulation techniques.
V. Explore various multiplexing technique and multiple access scheme.
VI. Compare different spread spectrum modulation.

5. DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Introduction of Digital Communication**	1a. Identify importance of various blocks of Digital Communication. 1b. Explain different characteristics of communication channels. 1c. Compare analog communication with digital communication.	1.1 Historical perspective of Digital Communication. 1.2 Elements of Digital Communication system with its block diagram. 1.3 Communication channel types and their characteristics (bit rate, bandwidth, repeater distance) applications, channel capacity, channel noise, Hartley's theorem, Shannon-Hartley theorem, significance of -1.6db. 1.4 Definition of information, entropy. 1.5 Comparison of Analog and digital communication system.
Unit– II **Digital Pulse Modulation Techniques.**	2a. Highlight significance of sampling theorem. 2b. Explain generation and demodulation of various digital pulse modulation techniques. 2c. Compare digital pulse modulation with analog pulse modulation	2.1 Sampling process: Nyquist sampling theorem. 2.2 Concept of Coherent & non-coherent Transmitter & receiver, Quantization process, quantization error, Quantization noise, Uniform, Non Uniform Quantization (Companding) & geometrical interpretation. 2.3 Pulse code modulation (PCM): Transmitter and Receiver block diagram and its working. Advantage and disadvantages of

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		PCM. 2.4 Differential pulse code modulation (DPCM): Transmitter and Receiver block diagram and its working, Advantage and disadvantage of DPCM. 2.5 Delta Modulation (DM): block diagram of Transmitter and Receiver, slope overload and Granular noise, Advantage and disadvantage of DM. 2.6 Adaptive Delta modulation (ADM): Transmitter and Receiver block diagram. Advantages and Disadvantages of ADM 2.5 Comparison of analog and Digital pulse modulation. 2.6 Comparison of various digital Pulse Modulations
Unit– III **Coding methods and Error control.**	3a. Highlight significance of source coding. 3b. Explain channel coding, their types and error correction codes. 3c. Apply various coding, error detection and error correction methods. 3d. Illustrate various types of line coding.	3.1 Source coding, Sources, Entropy, baudot code, Huffman coding. 3.2 Channel coding : error, causes of error and its effect, error detection and correction using parity, error control codes, checksum, Two dimensional parity check Vertical redundancy check (LRC), Cyclic Redundancy Check (CRC), Hamming codes, Block code, convolution code ,Turbo code. With simple examples 3.3 return to Zero (NRZ) and Return to zero (RZ), Bipolar (NRZ), Manchester (Split Phase), Differential Manchester Bipolar RZ, Pseudo ternary, alternate

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		Mark Inversion (AMI) and their waveforms.
Unit– IV **Digital Modulation Technique**	4a. Highlight significance of M-ary encoding. 4b. Classify various digital modulation techniques. 4c. Explain transmitter and receiver for digital communication. 4d. Draw constellation and phasor diagram. 4e. Compare various digital modulation techniques.	4.1 M-ary encoding, Minimum bandwidth. Amplitude shift keying (ASK), Frequency shift keying (FSK), phase shift keying (PSK), Transmitter and receiver block diagram and their working with waveform. 4.2 Quadrature Phase shift keying (QPSK), Quadrature amplitude modulation (QAM). 4.3 Differential phase shift (DPSK) transmitter and receiver block diagram and their working with waveform. 4.4 Constellation diagram and phasor diagram of each modulation techniques. 4.5 Comparison of digital modulation technique.
Unit– V **Multiplexing & Multiple Access**	5a. Explore various multiplexing technique and multiple access scheme. 5b. Explain FDM, TDM, CDM, SDM,WDM. 5b. Explain multiple access system like FDMA, TDMA, CDMA, SDMA. 5c. Compare OFDMA and CDMA.	5.1 Need of Multiplexing Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), code Division multiplexing (CDM), Space Division Multiplexing (SDM) definition, block diagram and their comparison. 5.2 Introduction to wavelength Division Multiplexing (WDM) 5.3 Multiple Access techniques: Time Division multiple access TDMA, frequency Division multiple Access FDMA, Code

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
		Division Multiple access CDMA, space Division Multiple Access SDMA, comparison of different Access techniques. 5.4 Wide band modulation Techniques: orthogonal Frequency Division Multiplexing OFDM, basic principle of orthogonality, single vs. multicarrier system, OFDM block diagram and its explanation. 5.5 Comparison between CDMA and OFDMA.
Unit – VI **Spread Spectrum Modulation**	6a. Illustrate PN Sequence. 6b. Explain Spread Spectrum Modulations; DSSS & FHSS. 6c. State Application of SS modulation 6d. Compare different spread spectrum modulation.	6.1 Introduction to spread spectrum (SS) Modulation, advantages over fixed frequency. Types of SS Modulation. Applications of SS modulation. 6.2 Pseudo Noise (PN) sequence: definition, generation and maximum length sequence. 6.3 Model of Spread Spectrum Modulation system. 6.4 Direct sequence spread spectrum signal. 6.5 Frequency spread spectrum: Slow frequency hopping and fast frequency hopping. 6.6 Comparison of Direct sequence spread spectrum (DSSS) and frequency Hop spread spectrum (FHSS). 6.7 DSSS based CDMA system, CDMA with FHSS block diagram.

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	**Introduction of Digital Communication**	08	04	02	02	08
II	**Digital Pulse Modulation Techniques**	08	04	04	04	12
III	**Coding methods and Error Control**	08	02	06	04	12
IV	**Digital Modulation Technique**	08	02	06	08	16
V	**Multiplexing & Multiple Access**	08	02	06	08	16
VI	**Spread Spectrum Modulation**	08	02	04	10	16
	Total	**48**	**16**	**28**	**36**	**80**

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	• Identify important blocks of a digital communication system and write functions of each block.	02
2	II	• Test the performance of Pulse Amplitude Modulation and demodulation. • Test the performance of Pulse Position Modulation and demodulation..	04 04
3	III	• Test the performance of Pulse Width Modulation and demodulation.. • Test the performance of Pulse Code Modulation and demodulation.	02 02
4	IV	• Test the performance of Delta Modulation and demodulation. • Test the performance of ASK Modulation and demodulation	02 02

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
5	V	• Test the performance of FSK Modulation and demodulation.. • Test the performance of PSK Modulation and demodulation..	4 4
6	VI	• Test the performance of TDM transmitter and receiver • Test the performance of FDM transmitter and receiver • Test the performance generate following different line codes and decode them-NRZ (Unipolar)-Bipolar NRZ - RZ UnipolaR Bipolar RZ	8
7		**Micro project related to content of Curriculum.**	04
Total			32

8. SUGGESTED STUDENTS ACTIVITIES

i. Solve the problems related with sampling, error detection, correction theorems.
ii. Solve the problems related with RZ, NRZ and all line coding technique

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

Sr. No.	Author	Title	Publisher
1	Bernard Sklar	Digital Communicatios , Fundamentals & Applications	PEARSON
2	Ha H. Nguyen	A First Course in Digital Communication	CAMBRIDGE UNIVERSITY PRESS
3	P. Ramakrishna Rao	Digital Communication	Tata Mcgraw Hill
4	Amitabha	Digital Communication	Tata Mcgraw Hill

	Bhattacharya		
5	Wayne Tomasi	Electronics Communication System	Pearson Education
6	Upen Dalal	Wireless Communication	Oxford

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

Pulse Code Modulation and demodulation kit.
Delta Modulation and demodulation kit.
ASK Modulation and demodulation kit.
FSK Modulation and demodulation kit.
PSK Modulation and demodulation kit.
QPSK Modulation and demodulation kit.
QAM modulation and demodulation.
DPSK modulation and demodulation.
TDM transmitter and receiver kit
TDM transmitter and receiver kit
NRZ (Unipolar)-Bipolar NRZ-RZ Unipolar-Bipolar RZ Kit

12. LEARNING WEBSITE & SOFTWARE

www.nptel.com
www.youtube.com
www.google.com

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
CO1	Identify importance of various blocks of Digital Communication.	3	3	3	3									8
CO2	Compare analog pulse modulation with digital pulse modulation	3	3	3	3									8
CO3	Apply various coding, error detection and error correction methods.	3	3	3	3									8
CO4	Classify various digital modulation techniques.	3	3	3	3									8
CO5	Explore various multiplexing technique and multiple access scheme.	3	3	3	3									8
CO6	Compare different spread spectrum modulation.	3	3	3	3									8
	Total Strength	3	3	3	3									**48**

Course Curriculum Design Committee

Dr. R. G. Wadekar, HOD, Department of Electronics and Telecommunication Engineering, Government Polytechnic , Aurangabad.

Dr. S. D. Yardi, Lecturer in Electronics, Government Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE : COMPUTER HARDWARE MAINTENANCE & NETWORKING

COURSE CODE : 6X412

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGG	FIFTH

1. RATIONALE

This subject is introduced to focus on basic working of the computer motherboard, peripherals and networking components.

Students will aware of basic concept of networking, its applications, topologies, communication media, network directing devices, protocol used, OSI reference model and TCP/IP model.

This subject will give exposure to students on computer hardware, peripherals, specifications, installation, faults and troubleshooting. Students will also be able to plan, analyze, design, install, configure, test, implement and maintain networking systems .Study of this subject will enable students to select appropriate hardware, list specifications, will identify simple to complex problems and their solutions. The subject is practical oriented and will develop the debugging skills in the students

2. COMPETENCY

A. Identify and repair the simple faults in computer systems.

B. Plan, analyze, design, install, configure, test, implement and maintain networking systems

3. TEACHING AND EXAMNATION 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) EXTERNAL	TW	
2	0	2	4	--	---	50	50	100

Legends5 : 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

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes. Students will be able to-

1. Identify & relate various hardware parts of Personal Computer (PC).
2. Outline & show the role of device drivers in operating system.
3. Improve system efficiency by various troubleshooting technique.
4. Configure different PC components.
5. Hands on experience in networking
6. Indentify and understand different types of Network Cable.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –I Overview of IBM PC Architecture.	1a. Configure fundamental Hardware components of computer. 1b. Identify different slots on Board. 1c. Identify Pentium I,II,III,I V & Itanium system.	1.1. System configuration, 1.2. IBM PC General layout showing Various Components 1.3. RAM details, Bus controls & I/O slot Details, Power supply. 1.4. Display adapters , memory cards, Floppy and hard disk ,USB drives 1.5. The keyboard, mouse. 1.6. Bus types: ISA, EISA, PCI, AGP, USB and FireWire 1.7. Distinguishing among the x86, Pentium I, II, III, IV & Itanium Systems.
Unit –II Basic software components	2.a Install different Operating system. 2b Compare different operating systems	2.1 BIOS and device drivers 2.2 Comparing operating system versions, 2.3 CONFIG.SYS and AUTOEXEC.BAT

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – III **Troubleshooting methodology**	3a Trouble shoot system faults. 3b Test motherboard failure . 3c Identify display problems 3d Trace common power supply problems . 3e connect input and output devices.	3.1 Running the power-on self-test. 3.2 Troubleshooting system faults with POST and video error codes 3.3 Testing for motherboard failures 3.4 Isolating keyboard and display problems 3.5 Common power supply problems 3.6 Making use of input/output devices
Unit – IV **Basic PC Components**	4a Compare CPU types .. 4b Configure jumper and CMOS settings. 4c Upgrade mother board with its accessories 4d Add plug & Play Devices. 4e Classify various types of Memory. 4f Classify various types of Memory.	4.1 CPU types: x86, Pentium I, II, III, IV 4.2 Configuring jumper and CMOS settings 4.3 Upgrading motherboards 4.4 Adding plug-and-play devices 4.5 Common power supply problems 4.6 Making use of input/output devices 4.7 Configuring network interface cards 4.8 Setting I/O device configurations 4.9 Memory types: DRAM, EDO, ECC,SDRAM, RAMBUS, SIMMs, DIMMs, RIMMs 4.10 IDE, E-IDE, optimizing hard disk Performance.
Unit – V **Input /Output Devices**	5a. To know different Input/Out put Devices. 5b. To know how to configure ports for communication. 5c. Diagnosing port problems.	5.1 Types of display adapters: VGA, SVGA & Graphic accelerators Accelerated Graphics Port (AGP) video. 5.2 Solving common printer problems Configuring serial/ parallel ports 5.3 Setting communication parameters, Diagnosing serial port problems

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – VI Introduction to Networks and Devices	6a Classify LAN ,WAN 6b Articulate network topology.. 6c Compare different types of cables. 6d Apply bridge ,repeaters gateways and other devices in network. 6e Compare OSI and TCP/IP references model .	6.1 Network classification: LAN, WAN, MAN. 6.2 Client server networks Network topology, Benefits of networks 6.3 Network cables- coaxial, UTP, STP, fiber optics their comparison 6.4 Characteristics Network standards- Ethernet, Ring, Token, wireless 6.5 Principle, operation and function of Hubs, Switches, Routers, 6.6 Bridges, Repeaters, Gateways, firewalls 6.7 OSI Reference Model - Interlayer Communication – Data Encapsulation, Functions of each layer. 6.8 TCP/IP Reference Model – Link, Internet, Transport, Application layer.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Overview of IBM PC Architecture	05	NA	NA	NA	NA
II	Basic software components	05	NA	NA	NA	NA
III	Troubleshooting methodology	05	NA	NA	NA	NA

Unit		Teaching	Distribution of Theory Marks			
IV	Basic PC Components	04	NA	NA	NA	NA
V	Input /Output Devices	04	NA	NA	NA	NA
VI	Unit – VI Introduction to Networks and Devices	07	NA	NA	NA	NA
	Total	32	NA	NA	NA	NA

7.LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

j;l	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1 Identity and understand different components of motherboard. 2 Identify & understand the different types of Keyboard, Mouse & troubleshooting procedure. 3 Demonstration of different connections of peripherals to computer, types of ports and diagnosis of most common problems related to external connections to PC . 4 Dismantle and assemble of computer system.	8
2	II	5. Understand different components of Hard Disks drive as a storage device & terms related to it. 6. Perform operations such as formatting and partitioning of Hard Disk.	8
3	III	7.Study of BIOS, its importance and Configuration of it. 8.Study and comparison of different types of monitors. 9.Display driver installation and settings. Trouble shooting of display adapters and display related problems. 10.Identify and Install various types of Display Adapters Operation and Trouble shooting of Switched Mode Power Supply.	6
4	IV	11.Installation of operating systems ,commonly used softwares 12. Installation of multiple operating systems on same machine	4
12	V	13.Identify and compare various types of printer, principle of operation, features and applications of each printer. 14. Installation of printer, network printer, sharing of printer 15. Identify and compare various types of scanners, principle, operation, features and application. Installation of scanner	4

j;l	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
13	VI	16.Indentify and understand different types of Network Cable. Connectors,Networking components such as ,hub, switches, gateways, patch panels, patch cords, I/O sockets, Rack. 17 Crimping of cable, testing and networking with Structured cabling 18. Installation of Client Server Network in Lab configuration setting, accessing machine on network, Remote access connectivity,	2
Total			**32**

7. SUGGESTED STUDENTS ACTIVITIES

1. Students should be shown animations/video films to explain the working concept of different types of peripherals such as keyboard, mouse, harddisk ,lan card, CPU ,motherboard & monitors
2. Samples of the peripheral components and devices should be brought in the class for demonstration while teaching those components and devices.
3. Dismantle and assemble of computer systems.
4. Identification of sockets, cables, connectors and ports etc.

8. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1.55" LED TV

2. Printers\scanners

3.Networking components and tools.

4. Diagnostic tools and soft wares.

9. LEARNING WEBSITE & SOFTWARE

1. www.nptel.iitm.ac.in (lectures on Electronics and Communication)
2. www.youtube.com. (lectures on Electronics and Communication)
3. www.howstuffworks.com
4. ccna.com
5. ccna.com/ccna-training
6. learningnetwork.cisco.com
7. www.mcse-training.com

8. www.microsoft.com/learning/en/us/certification/mcse.aspx
9. www.intel.com/products/processor
10. www.intel.com/products/desktop/motherboard

10. 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
CO1	Identify & relate various hardware parts of Personal Computer (PC).	-	-	3	3	-	-	-	-	-	3	-	3	-	5
CO2	Outline & show the role of device drivers in operating system.	-	-	2	2	-	-	-	-	-	2	-	2	-	5
CO3	Improve system efficiency by various troubleshooting technique.	-	-	3	3	-	-	-	-	-	3	-	3	-	5
CO4	Configure different PC components.	-	-	2	2	-	-	-	-	-	2	-	2	-	4
CO5	Hands on experience in networking	-	-	1	1	-	-	-	-	-	1	-	1	-	4
CO6	Indentify and understand different types of Network components.	-	-	2	2	-	-	-	-	-	2	-	2	-	7

Course Curriculum Design Committee:

Sr No	Name of the Faculty members	Designation and Institute
1	**Dr. R. G. WADEKAR**	HOD , Electronics and Telecommunication Engineering , Government Polytechnic , Aurangabad
2	**PROF S. D. NIMBEKAR**	Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- **PROJECT 1-SEMINAR**

COURSE CODE **6X501**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Telecommunication	**FIFTH**

1. RATIONALE

Seminar is the important aspect of any curriculum. Here the students has unlimited scope to integrate his knowledge and skills. This course is essential to understand the recent developments and latest trends in the field. This will help the students to acquire the skill like mining for information, analysis, communication, presentation skills etc. For effective presentation student must have good communication skill. With a given time limit student should be able to express his ideas and concepts, thoroughly in front of faculty members and other students, student should be able satisfy the queries raised by them as well as student should learn to take any feedback positively.

2. COMPETENCY

After learning this course student will be able to
"Deliver presentation to expose to recent development in technologies, researches, products, algorithms, protocols and so on"

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 EXTERNAL**	**PA (TW)**	75
00	-	02	02	--	--	25	**50**	
Duration of the Examination (Hrs)				--	--	02	--	

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. Collect the information on selected topic.
2. Prepare the synopsis on the identified content.
3. Make use of internet / book / research paper to assimilate information
4. Deliver presentation on selected topic.
5. Prepare report on seminar topic.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Literature Survey**	1Do literature survey and identify area of interest for Project preparation.	1.1. Detailed Survey of any three Project seminar topics which are a recent trend in the field of Electronics and Telecommunication . 1.2. Seminar topic should not be a part of any course which student has already studied or will study in final semester of diploma. Also topic should not be repeated in last three batches. 1.3. No two students are allowed to take same topic. Also contents of seminar of no two students should match more than 30%.
Unit -II **Topic selection**	1.Finalize a topic for Project seminar	2.1. Each student has to make synopsis of three topic selected by student. 2.2. Submit this entire synopsis to the seminar coordinator. 2.3. Finalize a topic from seminar coordinator after the confirmation from

		panel of faculty from dept.
Unit III: **Collection and Assimilation of Information**	1.Search on internet for information gathering.	3.1. Student should gather/collect all information related to final topic either from internet, book or from any research / journal paper. 3.2. Assimilate the information so that student gets to know that how they were applied these concepts into existing technology.
Unit IV: **Prepare and Deliver Presentation of Project Seminar**	1Prepare seminar project and present it.	4.1. Each student will prepare a seminar presentation in the term making use of audio/visual aids for duration of 10-15 minutes and deliver it on the assigned date only. Every student is required to give presentation independently. 4.2. All students must attend seminars and it is expected that they should listen it carefully and take part in questioning actively. 4.3. A panel of faculty members along with guide will assess the seminar internally during the presentation. Faculty members should ask questions.
Unit V: **Preparing Seminar Report**	1.Prepare report of seminar as per above instructions.	5.1. Each student should prepare Project seminar report containing at least 35 pages as per the format prescribed by department. Student should submit the seminar report in the form of spiral bound journal duly signed by the Guide, Head of Department and Principal.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching / Practical Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Literature Survey	**06**	**NOT APPLICABLE**			
II	Topic selection	**06**				
III	Collection and Assimilation of Information	**08**				
IV	Presentation of Seminar	**06**				
V	Preparing Seminar Report	**06**				

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	Literature Survey	06
2	2	Topic selection	08
3	2	Collection and Assimilation of Information	08
4	2	Presentation of Seminar	06
5	2	Preparing Seminar Report	04
		Total	**32**

8. SUGGESTED STUDENTS ACTIVITIES

i) Aspects to be considered for report writing

- To study recent developments and technological advances in current technology.
- Develop communication skills.
- To enhance the presentation skills
- Seminar reports preparation.

II) SUGGESTED AREAS FOR THE SEMINAR:

AREA OF ELECTRONICS AND TELECOMMUNICATION	1. Microcontroller based. 2. Communication based. 3. Networking 4. Software and Hardware interfacing. 5. Internet of Thing 6. Processor based. 7. Instrumentation based. 8. AVE Based 9. Mobile Computing 10. Arduino based.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

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

i. Do literature survey and identify area of interest for seminar preparation.
ii. Visit the site if required.
iii. Search on internet for information gathering.
iv. Do comparative study of methods, identify case study etc
v. Prepare report of seminar as per above instructions.
vi. Prepare power point presentation of Seminar topic.

Seminar Report Format

1. Seminar report shall be in the print form on A-4 size white bond paper.
2. Typing shall be in Times New Roman with spacing of 1.5 using one side of paper.
3. Margins: Left = 37.5 mm Right, Top and Bottom = 25mm.
4. Front page: Titles - TNR 18 bold, other – TNR 14 bold. With Institute Logo.

5. Inner Pages: Titles –TNR – 14 Bold, other TNR 12.
6. Page Nos: Should appear on the right hand top corner of each page starting after index page.
7. Tables to be preferable in the Text format only.
8. Sketches to be drawn on separate sheet / pages in black ink.
9. The Last content in the index to be of references. Acknowledgement to be added in the report.
10. Binding: Spiral binding is preferred for the seminar report. The number of copies are to be prepared by the student are 3 nos. (Student + Guide + Department copy)

LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Desktop PC	Computer Systems with minimum i-3 intel pentium processor (or equivalent) and 1 GB RAM.
2.	LCD Projector	

10. LEARNING WEBSITE & SOFTWARE

1. http://www.seminarsonly.com/
2. http://a4academics.com/be-seminar-topics
3. http://www.seminarstopics.com/branch/latest-seminar-topics-for-cse-2017
4. http://www.collegelib.com/t-71-topics-for-computer-engineering-and-cse-technology-seminars-listed-latest-topics.html

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

S No	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Collect the information on selected topic.	--	3	--	3	--	--	--	---	--	--	--	2
2	Prepare the synopsis on the identified content.	--	1	--	---	--	--	--	---	---	--	--	2
3	Make use of internet / book / research paper to assimilate information	---	--	3	3	---	---	--	1	--	--	1	--
4	Deliver presentation on selected topic.	--	2	3	--	--	--	---	--	--	--	2	2
5	Prepare report on seminar topic.	--	3	--	--	--	--	--	2	--	--	2	2

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	R.M.Ingle	Lecturer in Electronics and Telecommunication. Govt. Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE AUTOMOBILE ELECTRONICS-II [E]

COURSE CODE 6X506

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

The integration of Electrical engineering, electronics engineering, Telecommunication, computer technology and control engineering in Automobile Engineering is on the rise. Automobile electronics plays a vital role in functioning of various systems of vehicle. It is desirable to have knowledge of various interdisciplinary areas by a diploma engineer, who plays a role of a technician in the Automobile Industry.

2. COMPETENCY

"Maintain electrical & electronic systems in an automotive vehicle. "

3. TEACHING AND EXAMNATION SCHEME

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

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

1. Interface various types of computer peripherals.
2. Test and verify CAN bus signals.
3. Carry out the recommended procedures of the testing sensors/ actuators.
4. Demonstrate ABS and ESP on any modern vehicle.

5. Operate various auxiliary units of a vehicle.
6. Identify various components of OBD system.

5 .DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Topic 1: **Automobile Electronic Components**	1a. Understand various types of diodes, displays and their uses	1.1 Introduction to Automobile Electronics 1.2 Use of Diode 1.2.1 Semi conductor diode – Voltage regulator in charging system. 1.2.2 Photo Diode and LED – Ignition and display system. 1.2.3 Power Diode – Alternator (Charging System) 1.3 Introduction to digital visual display and analog visual display.
Topic 2: **Automotive Computer Technology**	2a. Understand open and closed loop control systems. 2b. Interface various types of computer peripherals 2c. Test and verify CAN bus Signals	2.1 Computer Basics and control systems 2.1.1 Block diagram of basic computer 2.1.2 Types of computer memory – i) Primary memory - Read only memory(ROM), Read/Write (R/ W), PROM, EPROM, EEPROM. ii) Volatile memory – RAM (Random Access Memory), KAM (Keep Alive Memory) 2.1.3 Open loop and closed loop control systems 2.2 Signal conditioning: 2.2.1 Conversion of signals- Analog to Digital and Digital to Analog 2.2.2 Types of communication systems in automobile – CAN Bus, LIN Bus,Wi-Fi, Bluetooth, Ethernet, Optic Fibers, GSM networks.
Topic 3: **Automotive Sensors and**	3a. Understand construction, working, and location of sensors 3b. Understand construction,	3.1 Sensors: 3.1.1 Construction, working and output signals of the following sensors - Crank shaft position ,

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Actuators	working and location of actuators 3c. Carry out the recommended procedures for testing sensors/ actuators.	Oxygen , Air flow measurement, Temperature, Pressure, Camshaft position, Speed, position sensors. 3.2 Actuators 3.2.1 Construction, working of the following Actuators - Idle speed actuator, Fuel pump, Unit injector, EGR Valve, Purge control Valve. 3.3 Recommended procedures for testing sensors/ actuators.
Topic 4: **Vehicle Control Systems and Instrumenta-tion**	4a. Understand various control systems such as MPFI, GDI, CRDI, ABS, ESP, Electronic Suspension, Electronic Power Steering, and Navigation Systems.	4.1 Vehicle control systems: 4.1.1 Power train control system: Electronic control system used in MPFI, GDI and CRDI system. Motion Control System: Introduction to ABS, ESP. Electronic suspension, Electronic power steering. 4.1.2 Safety systems: (Need and working only) Air bags, Collision avoidance, Low pressure warning system, Park assists. 4.2 Instrumentation: 4.2.1 Vehicle instrumentation and measurement of parameters – time, speed, temperature, distance and level. 4.2.2 Error analysis - types of errors and error compensation. 4.2.3 Navigation system – Global positioning system (GPS).
Topic 5: **Lighting System & Automobile Auxiliaries**	5a. Explain functioning of various lighting and Auxiliaries units of automotive vehicle. 5b. Operate various auxiliary units of a vehicle.	5.1 Lighting Fundamentals, Lighting Circuits, Gas discharge & LED lighting, types of lamps. 5.2 Meaning of auxiliaries, Construction, function & circuit arrangement of various auxiliary units such as: Horn,

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		Wiper, Flashers, fuel gauge, temp gauge, oil pressure gauge, warning lights, Mechanical & digital Speedometer & odometer, Electrical Fan for cooling system, Wind shield washer & Defogger, car stereo. 5.3 Power window, central locking with remote control & without remote control, key less entry.
Topic 6: **System Diagnosis**	6a. Understand Diagnostic Procedures of Systems and Transducers. 6b. Understand testing Procedures of Systems and Transducers. 6c. Identify various components of OBD system.	6.1 On board diagnosis (OBD) of MPFI/ CRDI system: 6.1.1 Stand alone diagnosis of electronic components: Diodes, sensors and actuators of the control systems. 6.2 Six step approach for Component Testing. 6.3 Types of measuring instruments and its application while checking signals and sensors. 6.3.1 Digital multi-meters, Oscilloscope, Thermometers, Battery testers, Lux meters, Frequency meters.

5. 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	**Automobile Electronic Components**	08	10	04	00	14
II	**Automotive Computer Technology**	09	04	08	02	14
III	**Automotive Sensors and Actuators**	09	06	04	04	14
IV	**Vehicle Control Systems and**	07	02	06	04	12

Unit	Unit Title	Teaching	Distribution of Theory Marks			
	Instrumentation					
V	**Lighting System & Automobile Auxiliaries**	07	04	04	04	12
VI	**System Diagnosis**	08	04	04	06	14
		48	**30**	**30**	**20**	**80**

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	I	Check a given Diode type and comment on the condition of the same.	02
2	II	Collect specifications and features of control systems of any modern Automobile with Reference to any system such as MPFI or GDI. Prepare a report of the same.	02
3	III	Identify and diagnose a sensor and comment on condition of the same.	04
4	IV	1. Collect specifications and features of control systems of any modern Automobile with reference to any system such as TDI and CRDI system used in a vehicle and prepare a report of the same. 2. Collect specifications and features of control systems of a vehicle, such as: ABS, ESP, Electronic Power Steering system and prepare a report of the same. 3. Collect specifications and features of control systems of a vehicle, such as: Electronic Suspension and Navigation Systems. Prepare a report of the same. 4. Demonstrate ABS and ESP on any modern vehicle.	06
5	V	1. Demonstrate automobile bulbs and lights. 2. Demonstrate various instruments & gauges (Dash board units). 3. Demonstrate construction of various electrical accessories e.g horn, wiper & flashers etc.	06
6	VI	1. Identify and diagnose an actuator and comment on condition of the same Using 2. Autotronics trainer kit, simulate the circuit for idle air control valve or any other autotronics application. 3. Prepare one block diagram for Detonation control using Microprocessor and detonation sensor.	06

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		4. Similar controls like Fuel Injection Control, Ignition timing Control, Lambda Control, Antilock Braking System, Electronic Stability Programme may be shown using a block diagram. 5. Identify various components of OBD system.	
7		**Micro project based on content of curriculum :**	04
Total			32

7. SUGGESTED STUDENTS ACTIVITIES

1. Seminar by Students on construction & operation of various electrical components & associated systems.
2. Visit a modern Service Station for observing Automobile Electronic and Computer controlled systems and prepare a report of the same
3. Internet Base Assignment, Teacher guided self learning activity etc. (These could be Individual or group base.)

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

a. Lectures cum discussion using Chart, Cut Section Model, and Display board.
b. Use of animations, video or power point presentation.
c. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Author	Title of Book	Publication
1	Allan W.M. Bonnick	Automotive Computer Controlled System.	Butter worth Heinemann
2	William B. Ribbens	Understanding Automotive Electronics Fifth Edition.	Newnes.
3	Lynn Mosher	Auto mechanic's Guide to Electronic Instrumentation And Microprocessor.	Prentice – Hall, Inc.
4	Bosch	Automotive Handbook	Bosch

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :--

a. Measuring instruments.
b. Various accessories like Flasher unit, Speedo meter etc.

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
CO1	Interface various types of computer peripherals.	3	3	3	3									8
CO2	Test and verify CAN bus signals.	3	3	3	3									8
CO3	Carry out the recommended procedures of the testing sensors/ actuators.	3	3	3	3									8
CO4	Demonstrate ABS and ESP on any modern vehicle.	3	3	3	3									8
CO5	Operate various auxiliary units of a vehicle.	3	3	3	3									8
CO6	Identify various components of OBD system.	3	3	3	3									8
	Total Strength	3	3	3	3									**48**

Course Curriculum Design Committee

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Engineering ,Government Polytechnic , Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE- AUTOMATION & CONTROL – II [E]

COURSE CODE 6X507

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

In different logical process, automation is used for optimum control of the process parameters. The Diploma students, aspiring to work in Automation industry must know fundamentals of logical control action. This course has been designed so that the students will be able to develop, program and troubleshoot applications of various PLC based logical control strategies for automation. Programmable Logic Controller works as brain of automation system, which can be programmed for desired functions for controlling different machines. The Industries therefore demand for persons having automation knowledge with skill of P.L.C. programming.

2. COMPETENCY

1. Program a PLC to execute various machine cycles.
2. Maintain simple PLC based process instrumentation systems

3. TEACHING AND EXAMNATION 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)@INTERNAL	PR	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Outline the concept of PLC.
2. Analyze & experiment with basic PLC functions.
3. Interface various peripherals with PLC.
4. Compile various PLC programs using Ladder Logic Function and advance functions.

5. Identify Input and Output devices for the given application & develop simple ladder Logic diagram for PLC process.
6. Discuss & propose right PLC for application.

5. DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –I **PLC Overview**	1a. Outline the concept of PLC. 1b.Describe principle of operation of PLC 1c. Differentiate between PLC and computer controlled systems 1d. Describe hardware components of PLC. 1e. Explain the block diagram of PLC.	1.1 Principles of operation of PLC, Block diagram. 1.2 PLC verses computer. 1.3 PLC hardware components. 1.4 Scan time of a cycle. 1.5 Industrial PLC. 1.6 Application of PLCs.
Unit –II **Basic PLC function**	2a. Describe the function of five common types of registers used in PLC. 2b. Develop ladder logic for flip flops (R-S, ONE SHOT, D, T, and J-K) in PLC. 2c. Describe module addressing for PLC. 2d. Analyze & experiment with basic PLC functions. 2e. Describe PLC retentive and delay timer functions 2f. State types and instructions of timing functions used in PLC. 2g. Draw ladder diagram and wiring diagram for each timer functions for PLC. 2h. Analyze & experiment with basic PLC functions. 2i. State types and instructions of PLC counter functions. 2j. Develop ladder logic for ON-OFF temperature control using timer, counter & limit switches.	2.1. PLC Registers and I/O addressing. 2.2. Register and flip-flop Characteristic. 2.3. Types of register (Holding, Input, Output register). 2.4. Module addressing. 2.5. PLC timer function. 2.6. Types and instructions of timer On Delay, Off Delay, Retentive, Non Retentive timer. PLC counter function. 2.7. Types and instructions of counter UP,DOWN,UP/DOWN counter.

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit-III **PLC peripherals & wiring**	3a. Identify analog input /outputmodule for PLC. 3b. Identify digital input /output module for PLC. 3c. Describe analog input /output module. 3d. Describe digital input /output module. 3e. Interface analog/digital input/ output module (including wiring) with PLC. 3f. Draw connection diagram to connect the switching devices with PLC. 3g. Describe the isolation technique. 3h. Draw the Isolated and non-isolated input wiring to PLC. 3i. Explain the Isolated and non isolated input wiring to PLC. 3j. Interface various peripherals with PLC.	3.1. Analog input/ output module. 3.2. Digital input/ output module. 3.3. Switching devices (level, pressure, flow, temperature, timer, proximity switch). 3.4. PLC input/output connection. 3.5. PLC power connection (wiring). 3.6. Isolated and non isolated input/output wiring to PLC.
Unit-IV **PLC Programming**	4a. Describe general programming procedure. 4b. List special key board and display functions of hand-held programmer 4c. List the steps to upload ON-line, OFF- line program by hand-held programmer 4d. List the steps for Programming sequence of PLC. 4e. Describe the legal (proper) / illegal (improper) PLC ladder diagram 4f. List the important scanning considerations for PLC. 4g. List the corrective steps to be taken in case of PLC operational fault. 4h. Develop Relay based logical functions. 4i. List out different types of PLC Programming languages.	4.1 Introduction to General PLC Programming Procedures. 4.1.1 Programming equipment-Hand held programmer 4.1.2 Programming sequence 4.1.3 PLC Ladder Diagrams 4.1.4 Process scanning consideration 4.1.5 PLC operational fault. 4.2 NOT, AND, OR, NAND, NOR, Ex- OR, Ex-NOR logic. 4.3 PLC Programming languages. 4.4 Boolean algebraic equation. 4.5 Holding (latching relay) contact. 4.6 Branching and complex branching Ladder logic. 4.7 Temperature control using ladder logic.

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
	4j. Develop Ladder logic for NOT,C AND, OR, NAND, Ex-OR, Ex-NOR logic. 4k. Develop ladder logic for given Boolean algebraic equation. 4l. Develop Ladder logic for holding contact. 4m Develop ladder logic for simple and complex branching. 4n. Compile various PLC programs using Ladder Logic Function and advance functions.	
Unit –V **PLC Applications & Troubleshooting**	5a Draw neat sketches of PLC process applications. 5b Identify Input and Output devices for the given application 5c Develop simple ladder Logic diagram for PLC process 5d State the trouble shooting steps for any PLC system 5e Identify Input and Output devices for the given application & develop simple ladder Logic diagram for PLC process.	1.1 PLC application: Logic diagram, sketches of process sequence, ladder logic program for 1. Bottling filling plant. 2. Material handling elevator. 3. 2-axis robot with sequencer control. 4. Level control. 1.2 Troubleshooting procedure.
Unit - VI Selecting PLC	State the criteria for selection of PLC 6a Select right PLC for a given application. 6b Prepare the specifications of a PLC.	1.1 Analog Input – Output Module. 1.2 Discrete Input – Output Module. 1.3 PLC selection criteria. 1.4 PLC specifications.

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	PLC Overview	**04**	02	04	01	07
II	Basic PLC function	**10**	04	08	03	15
III	PLC peripherals & wiring	**10**	03	04	08	15
IV	PLC Programming	**12**	02	06	12	20

Unit	Unit Title	Teaching	Distribution of Theory Marks			
V	PLC Applications & Troubleshooting	**07**	02	03	10	15
VI	Selecting PLC	**05**	02	03	03	08
	Total	**48**	**14**	**14**	**20**	**80**

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	1.Install hardware and software components of Given PLC system. (Check it's working by running a sample program.) 2.Identify intelligent, PID, Input, Output, Communication module. 3.Study networking of PLC by means of simulation	4
2	II	1.Develop ladder logic to realize D flip flop 2.Develop ladder logic to realize RS flip flop 3.Develop ladder logic to realize JK/T flip flop 4.Simulate Industrial application of PLC On Delay Timer. 5.Simulate Industrial application of PLC Off / ON Delay Timer. 6.Verify OFF/ON Delay timer operation using actual PLC 7.Simulate Industrial application of PLC UP/DOWN COUNTER 8.Verify UP/DOWN COUNTER operation using actual PLC	8
3	III	1.Assemble various modules and component of PLC to make a PLC system. 2. Wire given level control system for automation. 3.Wire given temperature control system for automation. 4.Wire given flow control system for automation.	4

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
4	IV	1.Implement NOT, AND & OR logic using relay(s). 2.Implement NAND & NOR logic using relay(s). 3.Implement EX-OR & EX-NOR logic using relay(s). 4.Build NOT, AND & OR logic using ladder diagram with the 5.help of PLC. 6.Build NAND & NOR logic using ladder diagram with the help of PLC. 7.Build EX-OR & EX-NOR logic using ladder diagram with the help of PLC. 8.Develop ladder to switch ON motor for given condition. 9.Develop ladder diagram for given level control system using level switch. 10.Develop ladder diagram for given temperature control system using temperature switch. 11.Develop ladder diagram for given flow control system using flow switch.	8
5	V	1.Simulate Bottle filing process on PLC simulator. Verify operation of the same process using actual PLC. Draw connection details for the same process. 2.Simulate material handling elevator operation on PLC simulator. Verify operation of the same process operation using actual PLC. Draw connection details for the same process.	4
6		**Micro project based on content of curriculum.**	4
		Total	32

8. SUGGESTED STUDENTS ACTIVITIES.

Following is the list of proposed student activities like:

a. Present seminar on any one topic related to the subject
b. Prepare/Download a dynamic animation to illustrate the following:
   i. Working principle of Timer
   ii. Working principle of Counter

Working of different types Ladder logic

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

a. **V**isits to Industries.
b. Use free simulators for PLC programming in the class when teaching.

c. Video films/ animation films on working of different type automatic system such as bottle filling plant, material handling elevator, 2-axis robot with PLC sequencer control, Process level control, Process temperature control Troubleshooting of PLC from YouTube and other resources.
d. Mini project based on 2 axis ROBOT, Designing of process control loop, PLC Industrial Application which is not covered in above Experiment list.

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Programmable logic Controllers Principles and applications	John w. Webb Ronald A Reis	PHI Learning
2	Automating Manufacturing System	Hugh Jack	Mc. Graw Hill, New Delhi
3	PLC Programming methods and applications	John R Hackworth Frederick D. Hackworth Jr	Pearson
4	Programmable Logic Controllers	Bolton W.	Elsevier India Pvt. Ltd. New Delhi
5	PLCs & SCADA: Theory and Practice	Rajesh Mehra and Vikrant Vij	Laxmi Publications, New Delhi, Latest edition

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :-

i. PLC Trainer: 24VDC , minimum 12 I/O ,TTL OR RELAY TYPE timer and counter, 4 Analog I/O.
ii. Sensors:Proximity (Inductive , Capacitive ,Photoelectric), Limit Switch.
iii. Multimeter
iv. Voltmeter, etc

12. LEARNING WEBSITE & SOFTWARE

i. www.control.com
ii. www.plcs.net
iii. www.pacontrol.com
iv. www.seimens.com

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
CO1	Outline the concept of PLC.	-	3	-	-	-	-	-	-	-	-	-	-	**4**
CO2	Analyze & experiment with basic PLC functions.	-	3	3	3	-	-	-	-	-	-	-	-	**10**
CO3	Interface various peripherals with PLC.	-	3	3	3	-	-	-	-	-	-	-	-	**10**
CO4	Compile various PLC programs using Ladder Logic Function and advance functions.	-	3	3	3	-	-	-	-	-	-	-	3	**12**
CO5	Identify Input and Output devices for the given application & develop simple ladder Logic diagram for PLC process.	-	2	2	2	-	-	-	-	-	-	-	2	**7**
CO6	Discuss & propose right PLC for application.	-	1	1	1	-	-	-	-	-	-	-	1	**5**
	Total Strength	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**48**

Course Curriculum Design Committee

S.D Nimbekar, Lecturer, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE- : ADVANCE MICROCONTROLLER [E]

COURSE CODE : 6X508

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

An ARM processor designed based on RISC technology is having advantages in terms of speed and power consumption. The fundamentals of this CPU in terms of its architecture and programming are essential to know for efficient embedded system design.

2. COMPETENCY

Develop systems based on ARM processor.

3. TEACHING AND EXAMNATION 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 INTERNAL	PA	150
3	-	2	5	80	20	25	25	
	Exam Hours			3	1	2		

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

- Recall & relate ARM architecture.
- Illustrate features, architecture & pin functions of ARM base microcontroller LPC2148.
- Distinguish & interpret ARM instruction set.
- Compile the assembly language programs using LPC2148 for various applications.
- Compile the ‘C’ language programs using LPC2148 for various applications.
- Interface the peripherals with LPC2148 to design efficient system as per desired application.

5. DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **ARM ARCHITEC-TURE**	1a. Get acquainted with various units/ blocks of Acorn RISC machine. 1b. Describe the ARM programmers model. 1c. Elaborate control flow instructions. 1d. Analyze conditional execution 1e. Compare: 3 stage pipeline, 5 stage pipe line ARM organization. 1f. Get acquainted with ARM instruction execution. 1f. Define exceptions in ARM 1g. Recall & relate ARM architecture.	1.1 The Acorn RISC machine, Architectural inheritance 1.2 ARM programmer's model control flow instructions 1.3 Conditional execution 1.4 3-stage pipeline ARM organization, 5-stage pipeline, ARM organization 1.5 ARM instruction execution 1.6 Exceptions in ARM
Unit– II **ARM BASED MICRO-CONTROLLER LPC2148**	2a. Illustrate features, architecture & pin functions of ARM base microcontroller LPC2148. 2b. Comprehend various blocks of ARM based Microcontroller LPC2148. 2c. Describe PLL & VBP divider as a system control block. 2.d Illustrate memory map. 2.e Explore the functions of GPIO, pin connect block, timers.	2.1 Features, Architecture (Block Diagram and its Description) 2.2 Pin diagram & functions of LPC2148. 2.3System Control Block (PLL and VPB divider) 2.4 Memory Map. 2.5 GPIO, Pin Connect Block, timer
Unit– III **ARM INSTRUCTION SET**	3a. Differentiate various addressing modes. 3b. Distinguish & interpret ARM instruction set. 3c. Identify data processing instructions. 3c. Identify ARM condition	3.1 Addressing modes 3.2 Data processing instructions 3.3 Data transfer instructions 3.4 ARM Condition codes

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
	codes 3d. Highlight effect of software interrupts (SWI) 3e. Apply Multiply instruction	3.5 Branches 3.6 Software interrupt (SWI) 3.7 Multiply instructions
Unit– IV **ASSEMBLY LANGUAGE PROGRAMMING**	4a. Develop and simulate ARM assembly language programs to transfer data from one register to another register. 4b. Develop and simulate ARM assembly language programs for arithmetic and logical operations 4c. Interface LED with ARM microprocessor. 4d. Interface switch with ARM and Develop a program to read status of the switch. 4g. Develop assembly language program to add two arrays into THUMB mode programming.	4.1 Writing simple assembly language programs for ARM 4.2 Programs for Data transfer. 4.3 Programs to perform logical operations. 4.4 Programs to perform arithmetic Operations 4.5 Programs to interface LED. 4.6 Programs to interface switch. 4.7 Thumb programmer's model and instruction set.
Unit – V **APPLICATIONS USING'C' PROGRAMMING**	5a. Develop 'C' language program to interface switch with ARM and write a program to read status of the switch. 5b. Develop 'C' language program to blink LED's. 5c. Develop 'C' language program to interface LCD with ARM . 5d. Develop 'C' language	5.1 Overview of C compiler and optimization. 5.2 Basic C data types, C Looping structures, Register allocations, function calls, pointer aliasing. 5.3 "C" programs for General purpose I/O. 5.4 "C" programs for General purpose timer. 5.5 "C" programs for interfacing with ADC, DAC.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	program to interface DC motor with ARM. 5e. Develop C' language program to interface stepper motor with ARM.	5.6 Interfacing with LED,LCD, KEYPAD. 5.7 Interfacing with DCmotor, stepper motor

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	**ARM ARCHITECTURE**	06	04	02	02	08
II	**ARM BASED MICROCONTROLLER LPC2148**	08	04	06	06	16
III	**ARM INSTRUCTION SET**	10	06	04	06	16
IV	**ASSEMBLY LANGUAGE PROGRAMMING**	12	04	06	10	20
V	**APPLICATIONS USING 'C' PROGRAMMING**	12	04	06	10	20
	Total	**48**	**22**	**24**	**34**	**80**

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	a) Identify various ARM 7 architectures available & compare their features.	2
2	II	b) Get familiar with trainer kit using LPC2148**.**	2
3	III	c) Introduction to ARM Assembly Language Programming with KEIL and Assembler Directives.	2
4	IV	d) Write and simulate ARM assembly language programs for transfer data from one register to another register. e) Write and simulate ARM assembly language programs for arithmetic and logical operations such as addition, subtraction multiplication, AND, XOR, OR….. f) Take 3 numbers and perform multiply and accumulate. g) Take 2 numbers and perform addition of square of numbers h) Write an assembly program to arrange given numbers in Ascending and Descending. Demonstrate original and arranged numbers in memory. i) Interface LED with ARM microprocessor and Write a Program to blink LED's connected on P0.1 to P0.12 and reset them in reverse manner at the interval of 1 sec. j) Interface switch with ARM and write a program to read status of the switch. k) Write assembly language program to add two arrays into THUMB mode programming. l)	14
5	V	m) Write 'C' language program to interface switch with ARM and write a program to read status of the switch. n) Write 'C' language program to blink LED's connected on P0.1 to P0.12 and reset them in reverse manner at the interval of 1 sec. o) Write 'C' language program to interface LCD with ARM & execute program for displaying text messages and numbers on LCD. p) Write 'C' language program to interface DC motor with ARM & execute program to rotate it clockwise-	08

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		anticlockwise. q) Write 'C' language program to interface stepper motor with ARM & execute program to rotate it in half step & full step mode.	
6		**Micro projects based on content of curriculum:**	04
Total			**32**

8. SUGGESTED STUDENTS ACTIVITIES

- Students should procure, read and comprehend the datasheet of LPC2148 & interfacing peripherals.
- Visit the mentioned websites, understand functionality, methods, practical applications, industrial requirements of ARM.
- Apply and implement prototype applications using LPC2148 development board.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

- Demonstrate the student actual programming, performance and result while teaching specific content.
- Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	ARM System on Chip Architecture	Steve Furber	Pearson Education
2	ARM Assembly Language, Second Edition	J R Gibson	Cengage Learning
3	The Insider's Guide To The Philips ARM7-Based Microcontrollers	Trevor Martin,	Hitex Publisher
4	ARM System Developer's Guide	Andrew Sloss, Dominic Symes, Chris Wright	ELSEVIER

S. No.	Title of Book	Author	Publication
5	An Embedded Software Primer	David E. Simon	Pearson Education.

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

Computers, LPC2148 ARM processor board, KEIL software, PROTEUS software, etc

11. LEARNING WEBSITE & SOFTWARE

http://nptel.ac.in/video.php

www.nxp.com

www.nptel.ac.in

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
CO1	Recall & relate ARM architecture.	-	3	-	-	-	-	-	-	-	-	-	-	6
CO2	Illustrate features, architecture & pin functions of ARM base microcontroller LPC2148	-	3	-	-	-	-	-	-	-	-	-	-	8
CO3	Distinguish & interpret ARM instruction set.	2	2	2	2	-	-	-	-	-	-	2	-	10
CO4	Compile the assembly language programs using LPC2148 for various applications.	2	2	2	2	-	-	-	-	-	-	2	-	8
CO5	Compile the ‘C’ language programs using LPC2148 for various applications.	2	2	2	2	-	-	-	-	-	-	2	-	8
CO6	Interface the peripherals with LPC2148 to design efficient system as per application desired	2	2	2	2	-	-	-	-	-	-	2	-	8
	Total Strength	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**48**

Course Curriculum Design Committee

- S.D.Sutawane , Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.
- V.G.Mahindra, Lecturer, Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.
- Dr. S.D.Yardi, Lecturer, Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) **(Chairman PBOS)**

COURSE TITLE: **INSTRUMENTATION & CONTROL II [E]**

COURSE CODE: **6X509**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	**Semester in which offered**
ELECTRONICS & TELECOMMUNICATION ENGINEERING	FIFTH

1. RATIONALE

Electronics is part and parcel of all modern instrumentation systems. Transducers, automatic process control, telemetry system, recorders, computer aided process control, data acquisition system and such others use a lot of electronics. Therefore, it is essential that every electronic and communication diploma engineer should know the basics of modern instrumentation and control systems so that the associated electronics can be maintained effectively. Hence, this course is developed to provide the fundamental knowledge of industrial instrumentation and control system to students to enable them to maintain the electronics modules

2. COMPETENCY

Select transducers, communication systems.
Analyze a process control system.

3. TEACHING AND EXAMNATION 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 (Internal)**	**PA**	**150**
3	-	2	5	80	20	25	25	
	Exam Hours			3	1	2		

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

1. Identify various types of instrumentation systems and their modules.
2. Justify need of signal conditioning.
3. Select appropriate transducer for measurement of physical parameters.
4. Monitor working of different types of process control systems.
5. Select appropriate types of telemetry system and recorders for relevant applications.
6. Analyze various types of computer aided process control system.

5 .DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
Unit-I **Introduction to Instrumentation**	1a. Describe different elements of instrumentation system with examples 1b. Classify the instrumentation systems. 1c. With sketches describe various types of standard instrumentation signals 1d. Justify the need of signal conditioning 1e. Explain different types of Signal conditioning systems. 1f. Identify various types of instrumentation systems and their modules.	1.1 Elements of instrumentation system including process and biomedical instrumentation i. Null and Deflection ii. Control and Monitoring iii. Analog and Digital 1.2 Standard instrumentation signals: Pneumatic, Current loop, 0-10 volts. 1.3 Signal conditioning: DC signal and AC signal conditioning.
	2a. Describe measurement techniques of physical parameters like torque, length, speed, level.	2.1 Measurement techniques i. Measurement of torque ii. Measurement of length iii. Measurement methods of level

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
Unit-II **Measurement of Physical Parameters**	2b. Explain working of magnetic flow meter 2c. Describe different types of pressure measurement techniques 2d. Classify temperature measurement techniques 2e. Describe working of different types of pyrometers 2f. Explain working of various types of position sensors 2g. Describe measurement techniques to measure humidity and moisture 2h. Describe working principle of Magneto-strictive, Hall effect, Ionization and Electrochemical Transducers 2i. Select appropriate transducer for measurement of physical parameters.	measurement: Laser, Microwave, Optical, Ultrasonic, Eddy current. 2.2 Magnetic flow meter 2.3 Pressure measurement techniques by i. Strain gauge, ii. Potentiometer, iii. Pressure switch 2.4 High and low temperature measurement i. Radiation type pyrometer ii. Optical type pyrometer 2.5 Position sensor i. Resistive type ii. Optical type iii. Inductive type 2.6 Measurement of moisture and humidity 2.7 Special types of transducers: i. Magneto-strictive transducers ii. Hall effect Transducers iii. Ionization Transducers iv. Electrochemical Transducers
Unit-III **Automatic Process Control**	3a. Explain need for automatic process control system. 3b. Explain different elements of automatic process control system. 3c. Describe different modes of process control system 3d. Monitor working of	3.1 Need of automatic process control elements of process control. 3.2 Advantages of automatic process control system. 3.3 Modes of process control system: i. Open loop ii. Closed loop(manual, on-off, P, I, D, PI, PD, PID) 3.4 Working of a automatic process control system.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	different types of process control systems.	
Unit-IV **Telemetry System And Recorders**	4a. Differentiate between the different types of telemetry systems 4b. Explain working of various types of electronic telemetry systems. 4c. Describe the function of smart and intelligent transmitters. 4d. Explain the working of different types of recorders with block diagram 4e. Name the electronic components used in Telemetry System and Recorders 4f. Select appropriate types of telemetry system and recorders for relevant applications.	4.1 Electrical telemetry system (current, position, impulse) 4.2 Electronic telemetry system (pulse Telemetry: Pulse Amplitude Modulation ,Pulse Frequency Modulation, Pulse Duration Modulation, Pulse position modulation) 4.3 Smart (intelligent) transmitters 4.4 Recorders Types i. Strip chart ii. Circular chart iii. X-Y plotter
Unit-V **Computer Aided Control Systems**	5a. State the application of computers in process control. 5b. Explain at the block diagram level the different elements of computer based control systems 5c. Describe the function of various blocks of CNC machine.	5.1 Role of computer in process control 5.2 Block diagram of the computer based control 5.3 CNC machine, various blocks of CNC machine 5.4 Standard interfaces: RS-232,RS-422A,RS-485,GPIB 5.5 Data acquisition system. 5.6 Virtual Instrumentation: Conventional and Graphical Programming.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	5d. Describe the use of different computer interfaces to connect various electronic devices. 5e. Describe the functions of Data acquisition systems	

5. 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	Introduction to Instrumentation	6	4	6	2	12
II	Measurement of Physical Parameters	12	4	8	8	20
III	Automatic Process Control	12	4	6	8	18
IV	Transmitters, Telemetry System and Recorders	08	4	5	6	15
V	Computer Aided Control Systems	10	6	4	5	15
	Total	**48**	**22**	**29**	**29**	**80**

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	Unit No.	Practical/Exercises	Approx Hrs. Required
1	I	Analyze standard instrumentation signals waveforms.	2
2	II	1.Test the performance of pressure type Potentiometer 2.Measure torque using strain gauge 3.Check the performance of synchros 4. Measure temperature using radiation/ optical pyrometer 5.Measure pressure using strain gauge 6. Test a DC position control system 7.Measure water level using resistive transducer 8.Measure water level using capacitive transducer 9.Measure water Level using ultrasonic transducer 10.Analyze the time response of second order processes with P Control	10
3	III	1.Analyze the time response of second order processes with P+I Control 2. Analyze the time response of second order processes with P+D Control 3. Analyze e the time response of second order processes with P+I+D Control	6
4	IV	1.Use x-y recorder and graphic recorder for the appropriate quantity measurement. 2. Analyze performance of PAM type telemetry system 3.Analyze performance of PPM type telemetry system	6
5	V	1. Analyze performance of data acquisition system 2.Transfer various type of data using RS-232,RS-422A,RS-485,GPIB standard cables.	4
6		**Micro project based on content of curriculum.**	4
Total Hours			**32**

7. SUGGESTED STUDENTS ACTIVITIES

i.Test different types of transducers using simulation software like Prosim, simulink, lab volt etc.

ii. Present seminar on any one topic related to the subject.

iii.Develop a small Instrumentation and Control project using LAB VIEW software.

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Industrial Visit

ii. Internet based assignments

iii. Organising expert lecture

iv. Display of appropriate video films

V. Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

Any simulation software that shows working of different instrumentation and control circuits like Prosim, simulink, LAB VIEW etc.

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :--

Sr.NO.	Name of the Equipment
1	Instrumentation and control trainer kits.
2	DC Regulated Power supply
3	Function generator
4	Digital Storage Oscilloscope
5	CRO

11. LEARNING WEBSITE & SOFTWARE

www.google.com

www.youtube.com

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
CO1	Identify various types of instrumentation systems and their modules.	0	3	2	1	0	0	0	0	0	0	1	0	4
CO2	Justify need of signal conditioning	0	3	2	1	0	0	0	0	0	0	1	0	2
CO3	Select appropriate transducer for measurement of physical parameters.	0	3	3	1	0	0	0	0	0	0	1	0	12
CO4	Monitor working of different types of process control systems.	0	3	3	2	0	0	0	0	0	0	0	0	12
CO5	Select appropriate types of telemetry system and recorders for relevant applications.	0	2	3	3	1	0	0	0	0	0	1	1	8
CO6	Analyzes various types of computer aided process control system.	0	3	3	2	1	0	0	0	0	0	1	0	10
	Total Strength		3	3	2	1						1	1	**48**

Course Curriculum Design Committee

Dr. S. D. Yardi Lecturer , Department of Electronics and Telecommunication

S. V. Salimbekar Lecturer , Department of Electronics and Telecommunication

HOD ET (Chairman, PBOS) **Co-ordinator(CDIC)**

COURSE TITLE: IN-PLANT TRAINING

COURSE CODE: 6X503

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION	**FIFTH**

1. RATIONALE

The diploma engineers of this discipline are required to work in industry to manufacture and test devices, components and parts, assemble circuits, testing qualities of products during different stages of assembly and also after end products; troubleshoot problems and repair electronic systems. The students need to have industry and workshop exposure, where they can see and work on real life equipment, materials, instruments and various kinds of electronic and / or communication systems . This course has been designed for the students to have real life experiences to help them prepare for their career. The Electronics & Telecommunication Engineering sector needs skilled and managerial personnel who have technical expertise, up to date knowledge as well as entrepreneurial qualities to manage the growing electronic industry.

2. COMPETENCY

At the end of this course student must be able to :

- **Work in industry to manufacture and test electronic devices, parts and components.**
- **Work in industry to assemble circuits for an electronic system, test the system as a whole.**
- **Work in industry to identify the faults, repair the faults, test the components and reassemble the electronic system.**

3. COURSE OUTCOMES (COs)

At the end of this course student must be able to :

1. Work in industry to know manufacturing and testing of electronic parts, components, devices.
2. Identify faults in Electronic systems, processes.
3. Dismantle and assemble a system.
4. Work in small scale industries designing embedded / communication systems.
5. Interact with the industry personnel.
6. Write a comprehensive report based on the 2/3/4 week summer in-plant- training.
7. Present the report in front of faculty and colleagues.

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#[OR] [External]	PA	
0	0	0	4	--	--	50	50	100
Presentation of report based on the 2/3/4 week summer in-plant- training.								

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

5. COURSE DETAILS

`	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
----------	-------NA--------	----------

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
---	------NA----------	---	--	--	--	--

7. SUGGESTED EXERCISES/PRACTICALS/ACTIVITY

S. No.	Unit No.	Practical Exercises/Activity (Outcomes in Psychomotor Domain)	No. of weeks
1		Work under the training supervisor (industry)	2/3/4

Sr. No.	Criterion of assessment (PA)	Evaluation by	
		Training Officer (Industry)/Feedback	Faculty (Institute)
1	Team spirit : participation in work allotted		
2	Punctuality		
3	Interaction with industry personnel		
4	Practical skills attained		
5	Project report preparation		

Progressive Assessment： Max. 50 marks

Based on the criterion mentioned above and in consultation with training officer (industry), internal faculty should evaluate training

1. Review of Log Book, Weekly Report during visit of teacher to industry.
2. Final project report at the end of training by Internal Faculty

End Semester Assessment : Max. 50 marks

3. Internal presentation and viva: in front of internal Faculty members and colleagues

at the end of the semester (Maximum 50 Marks)

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i. Students can interact with the identified faculty of the department to suggest his choices for suitable industry/service center
ii. Students have to get the training order letter and submit it to training officer in the industry on the first day of training.
iii. Student will have to get all the important information from the training officer regarding schedule of the training, safety situations, rules and regulations of the industry. Student is expected to follow these safety conditions , rules, regulations, procedures etc. with utmost alacrity.
iv. Students must keep record of all the useful information in Log book, maintain the weekly diary, write reports during the training period.
v. Students shall submit certificate of completion of training and feedback given by industry person.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Students must be informed beforehand to maintain the discipline, decorum of the industry, abiding to all rules and regulations and observe all the demonstrated technical activities carefully .
ii. Motivate students to use internet and collect name, addresses, catalogues, rates, specifications of manufacturers of various electronic systems.

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Title of Book	Author	Publication
--	------- NA --------	--------	-------

B) Major Equipment/ Instrument with Broad Specifications --- NA ----

C) Software/Learning Websites --- NA ----

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- Dr. R.G .Wadekar, HOD, Department of Electronics and Telecommunication Engineering , Government Polytechnic, Aurangabad.
- S.D Yardi , Lecturer, Department of E T, G. P., Aurangabad.

GOVERNMENT POLYTECHNIC, AURANGABAD

(An autonomous Institute of Govt. of Maharashtra)

Programme Curriculum Strucutre [6th Revision : Outcome Based Education -2017-18]

Name of Programme : DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

SIXTH Semester Courses

Sr. No.	SEM	Course code	Course Name	Teaching Scheme/Credits				Examination Scheme (Maximum Marks)								
				Theory (TH)	Practical (PR)	Tutorial (TU)	Total Credit (C)	PT	TH	PR	OR	PA (TW)	Total	Theory Exam Hours	Practical Exam Hours	Remarks
1	VI	6G305	Industrial Management	3	2		5	20	80~	--	--	25	125	--	--	
2	VI	6X409	Maintenance of Electronic Equipments	0	4		4	--	--	--	25#	25	50	--	2	
3	VI	6X406	Power Electronics	4	2		6	20	80	25#	--	25	150	3	2	
4	VI	6X413	Software Lab Matlab	1	4		5	-	--	--	50@	50	100	3	2	
5	VI	6X505	Mobile & Fiber Optics	4	2		6	20	80	25#	--	25	150	3	2	
6	VI	6X502	Project –II	0	4		4	--	--	--	50#	100	150	3	2	
7		**ANY ONE FROM GROUP ELECTIVE -III**														
A	VI	6X510	Reliability and Quality Management	3	2		5	20	80	--	25@	25	150	3	2	
B	VI	6X511	Electronic Product Design	3	2		5	20	80	--	25@	25	150	3	2	
C	VI	6X512	Embedded system	3	2		5	20	80	--	25@	25	150	3	2	
D	VI	6X513	DSD using VHDL	3	2		5	20	80	--	25@	25	150	3	2	
In plant training of 2/3/4 weeks between 4th and 5th semester [Summer vacation]:Report submission [PA] during 5th semester ESE [OR] [Internal]																
		TOTAL		15	20		**35**	80	320	**50**	**150**	**275**	**875**			

Legends : TH-Lecture; TU-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

HOD Electronics and Telecomm Engineering
Govt. Polytechnic, Aurangabad.

COURSE TITLE : **INDUSTRIAL ORGANIZATION AND MANAGEMENT**

COURSE CODE : **6G305**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	**Semester in which offered**
E&TC	**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 and Coordinate 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)				**02 [ONLINE]**	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. Identify need 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's Principles 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	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

& Legislative	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. 6b Track the project with the	6.1 Introduction of Project Management, project Network Analysis 6.2 Concept and introduction of CPM/PERT. 6.3 Concept of Breakeven analysis.

Management	help of project management techniques.	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,Aurangal
2	K.S.Borde	Lecturer in Civil Engineering, Govt. Polytechnic,Aurangabad
3	P.B.Lahoti	Lecturer in Computer Engineering, GovtPolytechnic,Aurangabad

(Member Secretary PBOS) **(Chairman PBOS)**

COURSE TITLE: MAINTENANCE OF ELECTRONICS EQUIPMENT
COURSE CODE: 6X409

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	SIXTH

1. RATIONALE

Equipment with electronic circuitry are increasingly being used in all the Industry and maintenance of them is the essential work for the proper functioning of the complete system. This course will enable the students to develop skills to maintain the basic electronic circuitry used in these equipment, which are employed in Industry and in consumer goods segments. This course will also enable them to fulfill the basic prerequisite for the advance maintenance issues which they will face in the Industry. After learning this course students can also start their own electronic repair workshop as a self-employer.

2. COMPETENCY

"Maintain the electronic circuits of various equipment. "

3. TEACHING AND EXAMNATION 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) EXTERNAL	PA	50
0	0	4	4	00	00	25	25	

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:

1. Identify and test various active and passive components.

2.Handle different types of Electronic measuring Instruments

3.Diagnose faults in electronics equipments.

4.Troubleshoot computer hardware and networking

5.Maintain SMPS, UPS, Inverter, solar power system, various analog and digital circuits, internal section of computer system, LED/ LCD TV, Cell phone (Mobile)/ microwave oven etc

6.Install solar panel.

5. DETAILED COURSE CONTENTS

` Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Concept of Maintenance	1a. Explain the basic steps of electronic equipment maintenance. 1b.Describe the types of maintenance 1c.Select the desired or proper instrument for suitable measurement. 1d.Summarize safety measure before troubleshooting. 1e.Explain troubleshooting procedure, fault analysis and fault location. 1f.Define reliability and its associated parameter. 1g.Identify with specification, commonly used tools. 1h.List dos and don'ts for use and maintenance of tools. 1f. Justify the need of modulation. 1g. Differentiate between analog & digital modulation using Waveforms.	1.1 Maintenance steps and its types 1.2 Preventive, predictive and breakdown maintenance 1.3 Measuring instruments 1.4 Precaution 1.5 Safety measures 1.6 Troubleshooting procedure 1.7 Equipment reliability and its parameter 1.8 Demonstration and use of hand tools: Screw driver, pliers, tweezers, wire stripper, scribers, hacksaw, files, bench vice, drilling machine, drilling bits (0.8, 1.0, 1.2,1.5mm)
Unit – II Testing of Electronic Component	2a. Use data book and hand book to find out the device specifications 2a. Use data book and hand book to find out the device specifications 2d.Identify and test various electronics components. 2e. Describe procedure for testing various electronics components 2f. Describe Soldering and de-soldering process of various types of electrical and electronics components.	2.1 Various parameters of Electronic active/passive components using data book 2.2 Search and know various parameters of different types of ICs using data book 2.3 Testing of passive components separately or Mounted on PCB like: Resistor, Capacitors Other components :Switches, , Inductors, Relays, Transformers 2.4 Fuses, Connectors, Single/three phase MCBs, single phase ELCBs, RJ45 connector.

` Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		2.5 Testing of all kind of active electronics components separately or Mounted on PCB using DMM or CRO like: Diodes, Transistors, FETs, MOSFET's, SCR,DIAC,TRIAC, Displays using LCD or LED ,TTL and CMOS IC's, Optoelectronics components. 2.6 Prepare component for soldering ,soldering and de soldering using soldering stations , concept of machine soldering
Unit – III Testing of Electronic Circuits	3a. Describe procedure for conducting A.C./D.C. voltage measurement and continuity test 3b. Inspect the various solder joints of given circuits 3c. Describe steps for testing of on board passive components 3d. Describe steps for testing of on board active components 3e. Describe steps for testing of on board ICs 3f. List steps for diagnosing faults of nonworking circuit and rectifying it.	3.1 Measurement of A.C. voltage and D.C. voltage using millimeter for the given circuit. 3.2 Continuity test of PCB track, wiring, switch etc. 3.3 Inspection of solder joints, defects of soldered joints in given circuits, familiarizations to rework and repair using multi-meter 3.4 Test the components like resistors, capacitors, inductors etc. connected on given PCB 3.5 Test the components like transistors, diodes etc. connected on given PCB 3.6 Test the ICs connected on given PCB 3.7 Diagnose fault and troubleshoot that in a given electronic circuit.

` Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – IV **Fundamental Trouble shooting Procedure**	4a Procedure for reading block diagram, circuit diagram & working 4b Troubleshooting & fault finding process. 4c Reading service, maintenance & instruction manual 4d Check associated equipments visually.	4a Reading of Block diagram , circuit diagram & working diagram. 4b Di_Assembly & Re_assembly. Trouble shooting process, fault finding aids. 4c Service, Maintenance & Instruction manuals, Test & measuring Tools 4d Pre troubleshooting Technique. 4e Checks associated equipments: visual check, calibration, isolates the troubling circuit, measurement, individual components.
Unit – V Maintenance of Home Appliances and Industrial Equipments	5a. Describe common Step maintenance of various type of home appliances 5b. Describe common Step of maintenance of various type of Industrial equipments 5c. Describe common Step of Maintenance of solar power system 5d. Describe common Step to Troubleshoot mobile	5.1 Maintenance of home appliances like microwave oven, LED/LCD TV, music player, mobile phone, laptop, camera, UPS, etc. 5.2 Maintenance of Industrial electronic equipments like …medical equipments, CRO, PLC based instruments. 5.3 Installation of solar power system. 5.4 Mobile hardware.

9. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARK (Theory)

There is no end of the semester theory examination and hence it is not applicable

10. SUGGESTED LIST OF EXERCISES/PRACTICAL

S. No.	Unit No.	Practical/Exercises (outcomes in psychomotor domain)	Approx. Hours Required
1.	I	Demonstrate use of various hand held tools.	04
2.	III	Test the performance of different passive electronic components (fixed/variable)	04
3.	III	Test the performance of active electronic components like general purpose transistor/FET/MOSFET/SCR/DIAC/TRIAC with DMM and CRO OR Components Tester	04
4.	III	Test the performance of miscellaneous electronics components(transformers ,Loudspeaker, microphone, Relays, Switches, DC Motors, Stepper Motor ,sensors	04
5.	II	Verify the functionality of TTL and CMOS Digital IC's using IC tester	04
6.	II	Explore datasheet of minimum any five electronics components and analog/ Digital IC's.	04
7.	V	Draw the given regulated power supply circuit/ SMPS (from any television/fridge/ computer system/ laboratory etc)	8
8.	V	Demonstrate steps of installation of online/ Offline UPS..	8
9	V	Layout of Components for Given CRO : • Tracing Vertical section used in CRO. • Voltage analysis in CRO. • Signal Tracing in CRO. • Fault finding in CRO by voltage analysis method.	8
10	IV	Layout of Cmponents for Given Power supply: • Tracing of Voltage regulation section. • Voltage analysis in Given power supply. • Fauly finding in given power supply by voltage analysis method.	8
11	IV	Demonstrate Installation of DTH system	8
			64

Note: Depending upon the availability of resources, perform any of the practical exercises from above list for total of minimum 28 hours so that skills matching with the most of the outcomes

of every unit are included.

11. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Maintain domestic electronic devices.
ii. Diagnose fault in the non working home appliance and rectify that.
iii. Discuss case study of any fault detection and rectification problem
iv. Maintain the office electronic equipment.
v. Make visit to service centers of gadgets/equipment covered in curriculum and if possible work there for some days on voluntarily basis during holidays.
vi. Search internet websites for DYS (Do Your Self) information for repair of electronic gadgets/equipment or collect manuals for repair and maintenance and try your hands to repair some gadgets/equipment based on that.

12. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

i. Show Video/ Animation film explaining different field applications.
ii. Prepare a chart related to maintenance of Electronics equipments.
iii. Arrange demonstration sessions of maintaining equipment/gadgets in labs by inviting engineers/technicians working in service centers of reputed makes as visiting lecturers for lab sessions
iv. Arrange visit to repair centers of reputed makes of consumer goods/Industrial equipment suppliers.
v. Arrange group discussions on the troubleshooting of electronic equipment issues.
vi. Arrange Seminar on Safety and Maintenance issues (ask students to explore the internet and visit nearby industries to collect information regarding the chosen topic/issue)

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Books	Author	Publication/Year
1.	Troubleshooting and Maintenance of Electronics Equipment	Singh K. Sudeep	Katson Book ,New Delhi ,II edition , Reprint 2014
2.	Troubleshooting Electronic Equipment: Includes Repair and Maintenance, Second Edition	Khandpur R. S.	Tata McGraw-Hill Education, New Delhi ,India , latest edition
3.	Mobile repairing Books	Manohar Lotia	BPB Publication, New Delhi , latest edition
4.	Data Books	National semiconductor	National semiconductor

14. Major Equipment/Materials with specification

1. CRO (Analog/ DSO),
2. Multimeter (Analog/ Digital)

3. Soldering and Desoldering Station
4. Different types of electronic and electrical cables, connectors, sockets, terminations.
5. Various analog and digital ICs
6. Neon tester 500 V.
7. Screw driver set (set of 5)
8. Insulated combination pliers 150 mm
9. Insulated side cutting pliers 150 mm
10. Long nose pliers 150 mm
11. Soldering iron 25 W. 240 V. with solder materials
12. Electrician knife
13. Tweezers 100mm
14. Soldering Iron Changeable bits 10 W
15. De- soldering pump
16. Crimping tool (pliers)
17. Allen key set (set of 9)
18. Magnifying lenses 75mm with illumination
19. Continuity tester
20. Dual DC regulated 15-0-15 volt, 2 Amp
21. LCR meter (Digital)
22. Signal Generator, 0-100 KHz
23. Battery Charger
24. Digital and Analog IC Tester
25. General purpose PCBs, bread board, MCB , ELCB
26. Clip on ammeter
27. RF Power meter
28. Field strength meter
29. Air Blower (500 Watt)
30. UPS

15. Learning Websites/ Software

http:// youtube.com (Repairing of various gazette)
http://www.automationtechnology.de/cms/en/markets-solutions/electronics.html
http://www.talkingelectronics.com
www.fixya.com
www.ifixit.com
www.fastrepairguide.com
ww.repairfaq.org

16. 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
CO1	Identify and test various active and passive components.	1	2	3										--
CO2	Handle different types of Electronic measuring Instruments		3	2	3									---
CO3	Diagnose faults in electronics equipments.			1	2						3			---
CO4	Troubleshoot computer hardware and networking			1	2						3			---
CO5	Maintain SMPS, UPS, Inverter, solar power system, various analog and digital circuits, internal section of computer system, LED/ LCD TV, Cell phone (Mobile)/ microwave oven etc		1	2	3						3			---
CO6	Install solar panel.		1	3							2			---

Course Curriculum Design Committee :

Sr No	Name of the Faculty members	Designation and Institute
1	**Dr. R. G. WADEKAR**	HOD , Electronics and Telecommunication Engineering , Government Polytechnic , Aurangabad
2	**PROF,R. A. BURKUL**	Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.
3	**PROF.G. G. VAISHNAV**	Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

COURSE TITLE- POWER ELECTRONICS

COURSE CODE 6X406

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**SIXTH**

1. RATIONALE

It is essential to have theoretical and practical knowledge and use power electronics to control electrical machines in commercial and industrial sector. This course will be able to understand the construction, working, and applications of various types of power electronics components like SCR, DIAC, TRIAC, IGBT and applications. This course is therefore designed so that the diploma engineers will be able to use power electronics for controlling AC and DC power in various applications

2. COMPETENCY

Control AC/ DC power in various applications.

Experiment with various power devices and their applications.

3. TEACHING AND EXAMNATION 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 EXTERNAL**	**PA**	150
4	0	2	6	80	20	25	25	
	Exam Hours			3	1	2	--	

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

1. Classify & compare Thyristors.
2. Experiment with firing angle of thyristor & demonstrate various methods to turn ON Thyristor.
3. Select thyristor protection circuits and demonstrate commutation methods thyristor.
4. Illustrate, Elaborate & Experiment with single phase controlled rectifier.
5. Illustrate, Elaborate & Experiment with single phase inverters & choppers.
6. Demonstrate & propose the solutions for current controlling applications by the use of thyristor.

5 .DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Thyristors family**	1a. Classify Thyristor Family devices 1b. Describe working, constructional features of SCR, LASCR, DIAC, TRIAC, GTO, PUT, SCS,UJT with the help of characteristic curve . 1c. List the applications of power devices 1d. Explain the working of SCR using Two transistor analogy. 1e. Compare various Thyristors.	1.1. Classification of Thyristor Family. 1.2. Power transistor, Power MOSFET, IGBT, SCR, LASCR, TRIAC, DIAC, GTO, PUT, SCS, UJT; their Construction, characteristics and principle of operations. 1.3. Comparison of the power devices. 1.4. Specifications of SCR and its ratings. 1.5. Two Transistor analogy of SCR. 1.6. Parallel and series connected SCR's. 1.7. List of applications of power devices.
Unit –II **Firing circuits for Thyristor family**	2a. Explain the different SCR turn –ON methods. 2b.Describe the function of power control using UJT & SCR. 2c.Explain the principle of R & RC firing circuits. 2d.Experiment with firing angle of Thyristor2e. Demonstrate various methods to turn ON Thyristor.	2.1 Methods of turn on of a thyristor. 2.2 Principle features of firing circuits. 2.4 Simple R and RC firing circuits. 2.4 UJT pulse triggering circuit. 2.5 Ramp and pedestal triggering circuit.

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-III **Thyristor protection & Commutation circuits**	3a. Justify the need of SCR protections. 3b. Describe working of Snubber circuit, freewheeling diode, & heat sink for SCR. 3c. State the need to turn off SCR. 3d. Differentiate various types of commutation methods with sketches 3e. Refer SCR datasheets for the given parameters 3f. Justify the need to turn OFF the SCR 3g. Classify & select thyristor protection Circuits 3h. Demonstrate commutation methods for thyristor.	3.1 dv/dt and di/dt ratings. 3.2 Snubber circuit. 3.3 Crowbar Circuit. 3.4 Heat sink and their uses. 3.5 Types of Commutation: Class A, Class B, Class C, Class D, Class E, Class F, their advantages, disadvantages & comparison.
Unit - IV **Single phase Controlled Rectifiers**	4a. Compare the difference in working of the single phase half wave, full wave controlled rectifiers with R & RL load. 4b. Use of SCR, UJT triggering circuits 4c. Illustrate, Elaborate & Experiment with single phase controlled rectifier	4.1 Half wave controlled rectifier with R, RL load. 4.2 Full wave controlled rectifier with R, RL load. 4.3 Half controlled rectifier with R & RL load. 4.4 Fully controlled rectifier with R& RL load. 4.5 Effect of Freewheeling diode. 4.6 Dual converter (No mathematical approach)

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit - V **Single phase Inverter & Choppers**	5a. Explain basic working principle of inverter 5b. Classify inverters. 5c. With sketches, explain the working of inverter circuit using SCR. 5d. Distinguish the working of series and parallel inverters using SCR 5e. Explain the working principle of Chopper and its applications 5f. Compare the salient features of different types of choppers 5g. Illustrate, Elaborate & Experiment with single phase inverters & choppers.	5.1 Working Principle of operation of Inverter. 5.2 Classification of Inverters. 5.3 Operation of the single phase Half Bridge inverters, 5.4 Operation of the single phase Full Bridge inverters 5.5 Basic series Inverter its Analysis & parallel inverter. 5.6 Principle of operation of Chopper 5.7 ON-OFF control method. 5.8 Step-up, step-down chopper. (No mathematical approach)
Unit – VI **Applica-tions of Thyristor Family**	6a. Demonstrate use of SCR as in Light dimmer, Circuit breaker & DC motor control . 6b. Demonstrate & propose the solutions for current controlling applications by the use of thyristor.	6.1 Light dimmer circuit 6.2 Automobile flasher circuit 6.3 SCR circuit breaker 6.4 SCR D.C. motor control 6.5 DC time delay relay using SCR /UJT 6.6 Variable voltage, variable frequency inverter [PWM method] using IGBT. 6.7 Chopper fed DC drive using power Transitors.

5. 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	Thyristors family	08	04	04	04	12
II	Firing circuits for Thyristor family	12	02	04	08	14
III	Thyristor protection & Commutation circuits	12	04	08	08	20
IV	Single phase Controlled Rectifiers	10	02	02	08	12
V	Single phase Inverters & Choppers	12	02	02	08	12
VI	Applications Of Thyristor Family	10	02	04	04	10
	Total	**64**	**16**	**24**	**40**	**80**

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1. Compare the ratings and packages of SCR, DIAC, TRIAC, GTO, PUT, SCS and UJT using data sheet. 2. Plot V/I Characteristics of SCR. 3. Plot V/I Characteristics of TRIAC. 4. Plot V/I Characteristics of DIAC. 5. Plot V/I Characteristics of Power Transistor 6. Plot V/I Characteristics of Power MOSFET/IGBT	8
2	II	7. Perform R & R-C triggering using SCR. 8. Test the performance of UJT Triggering circuit.	4
3	III	9.Test the performance of Class B commutation circuit 10.Test the performance of Class C commutation circuit	4
4	IV	11.Test the performance of Half wave controlled rectifier with R & RL Load. 12.Test the performance of Full wave controlled rectifier with R & RL Load.	4
5	V	13. Test the performance of Step-Up chopper. 14. Test the performance of Step-Down chopper. 15. Test the performance of Series Inverter using SCR. 16. Test the performance of Parallel Inverter using SCR.	8

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
6	VI	17.Test the performance Light Dimmer circuit using SCR. 18.Test the performance of SCR circuit breaker. 19.Test the performance of SCR DC motor Control	4
7.		**Micro project based on content of curriculum :**	6
Total			**32**

7. SUGGESTED STUDENTS ACTIVITIES

i. Find Specifications and package of SCR, TRIAC, DIAC, PUT from datasheet.
ii. Prepare a report on various types of drives used in nearby industries.
iii. Assignments on solving numerical.
iv. **Mini projects**: (Should be given individual basis from following)
- Fan regulator using TRIAC/DIAC
- Light operated Relay
- Solid State Relay using Diac-Triac
- SCR Firing using UJT.

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

a. Industrial Visits nearby Industries to see the industrial applications of Power devices & circuits.
b. Internet Based assignments.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Power Electronics	Rashid, Muhammad H.	PHI Learning, New Delhi latest edition
2	Power Electronics	Singh,M. D. Khanchandani, B.	Tata Mc. Graw Hill, New Del
3	Power Electronics	Bimbhra, P.S.	Khanna Publisher, New Delhi latest edition
4	Industries and power Electronics	Rai, H.C.	Umesh Publications. New Delhi latest edition
5	Thyristor Engineering	M.S. Berde	Khanna Publisher
6	Industrial Electronics	G.K. Mithal	Khanna Publisher

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :--

Trainer Kits for

1. SCR, DIAC, TRIAC.
2. Instruments Like, CRO, Function Generator, Power supply, Digital multimeter, bread board, etc

11. LEARNING WEBSITE & SOFTWARE

a. www.nptel.iitm.ac.in
b. www.youtube.com. (lectures on Power electronics)
c. www.howstuffworks.com
d. www.alldatasheet.com
e. Electronics Work bench

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
CO1	Classify & compare Thyristor	3	3	1	1	-	-	-	-	-	-	-	-	-	08
CO2	Experiments with firing angle of thyristor & demonstrate various methods to turn ON thyristor	1	2	1	1	-	-	-	-	-	-	-	-	-	06
CO3	Select thyristor protection circuits & demonstrate commutation methods for thyristor.	1	3	2	2	-	-	-	-	-	-	-	-	-	09
CO4	Illustrate, Elaborate & Experiment with single phase controlled rectifier.	2	3	2	2	-	-	-	-	-	-	-	-	-	08
CO5	Illustrate ,Elaborate & Experiment with single phase inverters & choppers	1	3	3	3	-	-	-	-	-	-	-	-	-	09
CO6	Demonstrate & propose the solutions for current controlling applications by the use of thyristor.	2	2	2	2	-	-	-	-	-	-	-	-	-	08
COURSE	**Total Strength**	**2**	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-	

Course Curriculum Design Committee

- S.D Nimbekar, Lecturer, Department of Electronics and Telecomm, Govt. Polytechnic, Aurangabad.
- Mrs. V.G Mahendra, Lecturer, Department of Electronics and Telecomm, Govt. Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE : **SOFTWARE LAB -MATLAB(MTB)**

COURSE CODE : **6X413**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Electronics & Telecommunication	**SIXTH**

1. RATIONALE

Now a day's most of the electronic circuits and systems are designed by using a computer. Industry expects a Diploma engineer(Technologist) to use modern day Electronic Design Automation tools (EDA) tools for analyzing, designing and real time testing of analog and digital systems. These operations are useful in developing, fabricating and testing new prototype circuits and their behavior.

MATLAB is a very powerful tool for simulation of real time systems. Over the year it has been grown into a flexible computing system capable of solving essentially any technical problem. It makes programming task easier and more efficient. Due to complexity of electronics circuits, systems it is essential to use MATLAB to handle large data and solve complex problems accurately. Students will learn basic matrix formulation and operations, programming techniques and simulating simple electronic circuits using Simulink and block set available in MATLAB.

2.

3. COMPETENCY

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

"**Design and simulate simple electronic circuits and systems using MATLAB and appropriate tools**"

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 INTERNAL**	**PA (TW)**	100
1	-	4	5	--	--	50	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

5. COURSE OUTCOMES

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

1. Use MATLAB for different mathematical operations
2. Solve a simple problem using different programming techniques.
3. Identify and use basic tools required for Electronics Engineering
4. Simulate the simple electrical/electronics circuits

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit - I MATLAB Basics	1a. Identify MATLAB Toolbox	1.1 The MATLAB environment 1.2 MATLAB tools Editor, Debugger, the workspace browser, the help browser, GUI design tools 1.3 Basic computer programming 1.4 Variables and constants, data types, operators & simple calculations 1.5 Formulas and functions.
Unit – II Matrices and Vectors	2a. Perform Matrix operations and functions in MATLAB	2.1 Matrix and linear algebra review 2.2 Vectors and matrices in MATLAB 2.3 Matrix operations and functions in MATLAB 2.4 User defined functions in MATLAB.
Unit - III Computer Programming	3a. Create MATLAB scripts and functions	3.1 Algorithms and structures 3.2 MATLAB scripts and functions (m-files) 3.3 Simple sequential algorithms, Control structures, loops 3.4 Introduction to plotting- using simple xy plots, printing a plot, exporting a plot as graphical image, Multiple plots, line color, line style, marker style, legends, logarithmic scales 3.5 3D line Plotting

		3.6 Graphical user interface
Unit – IV MATLAB Programming	4a. Read and write data 4b. Handle MATLAB files	4.1 Reading and writing data, 4.2 MATLAB file processing/handling 4.3 MATLAB graphic functions
Unit V Introduction to Simulink and MATLAB toolboxes	5a. Simulation of characteristics of electronic devices. 5b. To build and Simulate electronic circuits	5.1 Introduction to Simulink 5.1 Getting Started with Simulink 5.2 Building a model 5.3 Introduction to block sets 5.4 Introduction to MATLAB toolboxes related to electronics.

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	MATLAB Basics	Not Applicable				
2	Matrices and Vectors					
3	Computer Programming					
4	MATLAB Programming					

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

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS: Practical's may be conducted as per the following list or of similar type based on curriculum.

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	MATLAB IDE: desktop, introduction to different tools such as Editor, Debugger, the workspace browser, the help browser.	4
2	2	Arrays, Matrix and Array Handling	4
3	2	Construct a matrix of given dimensions and calculate inverse and Eigen values for the same matrix.	4

4	2	Apply different mathematical operations such as addition, subtraction, multiplication and division for given matrices.	4
5	3	Create MATLAB scripts and functions examples such as sum of digit, factorial, leap year, roots of quadratic equation	4
6	3	Use different loop such as 'for', 'while', 'if' and 'if—else' to solve a simple problems. Factorial, prime numbers, searching and sorting numbers.	4
7	3	Model a half wave rectifier circuit with Vin=5V,50Hz and R=1 ohm(diode drop=0.8 V) And observe it on CRO using Simulink	4
8	4	To model the equation that converts Celsius temperature to Fahrenheit $T_F = 9/5(T_C) + 32$	4
9	4	Generate a signal X(t)= 5sin(100*pi*t) And observe it on CRO using Simulink	8
10	4	Simulate the VI characteristic of SCR, DIAC, TRIAC	8
11	4	Simulate single stage amplifier	8
12	4	Open ended mini project using communication/ control systems tool box.	8
Total			64

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.

a. Identify applications of MATLAB in electronics engineering
b. Assignments on solving numerical
c.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

Not Applicable

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Getting started with MATLAB	RudraPratap	New York Oxford University Press
2	MATLAB Programming for Engineers	Stephan J Chapman	CENGAGE Learning

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

S. No.	Name of equipment	Brief specification
1.	MATLAB Software	Latest software available in the Market

12. LEARNING WEBSITE & SOFTWARE

a. www.nptel/matlab.com
b. www.nptel/introductiontomatlab.com

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	01	02
1	Construct a matrix & apply different mathematical operations	3	2	3	3	-	-	-	3	-
2	Solve a simple problem using different loops	3	3	2	3	-	-	-	3	-
3	Identify and use basic tools for Electronics Engineering	3	2	2	3	-	-	-	3	-
4	Working with M files and writing user defined functions.	3	3	3	3	-	-	3	3	-

5	Build models and Simulate the simple electronics circuits	3	3	3	3			3	3	

Course Curriculum Design Committee

Sr No	Name of the faculty members	Designation and Institute
1	A S Abak	Lecturer in Electronics Govt. Polytechnic, Aurangabad
2	Dr. S B Dhoot	Lecturer in Electronics, Govt. Polytechnic, Aurangabad

Member Secretary **Chairman PBOS**

COURSE TITLE : **MOBILE AND FIBER OPTIC COMMUNICATION**

COURSE CODE : **6X505**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	SIXTH

1. RATIONALE

In this world of connectivity and collaborative work environment, it is necessary to connect to the network from anywhere, with anybody, at anytime. Wireless communication provides connectivity with mobility, flexibility and convenience. Wireless devices are used across the various industries like Healthcare, Education, Automation, Renewable energy sector, Automobile etc. Effective use of Social networking has become possible due to high end wireless devices. This course will help the students to develop skills to handle wireless and mobile communication systems.

The deployment of fiber optic technology is enhancing at very fast pace. Cost trends for fiber vs copper, better transmission quality, and a reduction in fiber maintenance expense are the major reasons for using fiber optic technology for the present wired communication network . The fact that the fiber optic facilities, which are the most economical and efficient means of providing existing telecommunication service, also possess the capability of transporting video signals is naturally an additional reason supporting their use. This course will facilitate students to use the principles of optical communication systems.

2. COMPETENCY

The aim of this course is to help student to attain the following industry identified competency through various teaching learning experiences.

Maintain mobile communication systems.

Maintain optical communication systems

3. TEACHING AND EXAMNATION 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 (EXTERNAL)**	**PA**	**150**
4	0	2	6	80	20	25	25	
	Exam Hours			3	1	2		

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

1.Troubleshoot mobile handsets.

2. Assess cellular systems capacity.

3.Assess performance of standards of different cellular mobile systems.

4.Interpret the functions of the various blocks of optical fiber communication system.

5.Measure the optical fiber cable parameters

6.Analyze losses in optical fiber communication system

5 .DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit – I Introduction to Mobile Communication System.	1a.Differentiate various generations of mobile communication. 1b. Explain basic block diagram & components of cellular system. 1c. Explain the block diagram of mobile phone unit.	1.1 Evolution of mobile radio communication (1G,2G,3G,4G & 5G). 1.2 The cellular concept. 1.3 Basic Cellular system, Block diagram & operation. 1.4 mobile station, base station, Traffic channel (Forward and

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
		Reverse) , Control channel (Forward and Reverse) 1.5 Mobile Phone Unit **:** Block diagram , Working ,Features of Transmitter and receiver section, Frequency Synthesizer ,control unit and logic unit of Mobile phone.
Unit – II Fundamental of Cellular system	2a. Explain the given terms, with respect to Cellular systems. 2b.Apply the principle of frequency reuse for the given coverage area. 2c.Choose the handoff mechanism for the given situation with justification. 2d.Explain the effect of the given interference on cellular system performance. 2e.Select the relevant method to improve coverage and system capacity of the given cellular system with justification. 2f.Calculate number of traffic channels and control channels for the given frequency spectrum and the given frequency reuse ratio.	2.1 Cellular concept fundamentals: Cell, cell structure, Cluster, frequency reuse, Reuse factor, minimum reuse distance, channel assignment strategies 2.2 Handoff **:** Concept of handoff, Types of Handoffs: Hard, Soft, Queued, delayed, MAHO (Mobile Assisted Handoff) , Proper and Improper Handoff, Umbrella cell approach 2.3 Interference and system capacity**:** Co-Channel interference, Adjacent Channel Interference, Channel Planning for wireless systems. 2.4 Improving Coverage and capacity in cellular systems**:** Cell splitting, Sectoring, Microcell Zone concept. Repeaters for range extension
Unit – III Digital Cellular	3a. Describe with relevant sketch the architecture of the GSM based cellular standard. 3b.Explain features of the given mobile communication standard. 3c. Describe with relevant sketch	3.1Global System for Mobile Communication (GSM): Features and services-GSM radio aspects, GSM architecture. GSM channel types, Security aspects. 3.2 GSM call routing : Mobile

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
System	call processing stages in the given cellular standards. 3d. Explain the features of CDMA based cellular system. 3e. Explain the features of 4G.	terminated call and mobile originated call sequence ,Stages of call processing in GSM 3.3 IS-95 **:** features, Radio aspects, comparison with GSM standards 3.4 Need for 3G & 4G technology, IMT-2000 global standards 3.5 Next generation mobile standards: features of 4G, VoLTE, and 5G.
Unit – IV Fundamentals of optical fiber communication systems	4a. Compare fiber optic communication with other wired communication 4b. Select proper optical band for the given application. 4c. Describe the functions of the given blocks in the Optical fiber communication system. 4d. Describe use of fiber optics communication for given application with justification 4e. Explain the given terms related to optics theory. 4f. Explain propagation of light through two medium having different refractive index. 4g. Calculate acceptance angle, critical angle and numerical aperture of a given optical fiber cable.	4.1 Introduction, Various wired communication mediums – copper wire and optical fiber cable 4.2 Electromagnetic spectrum: optical band and its range, Optical windows. 4.3 General Block diagram of optical Fiber communication system 4.4 Advantages, disadvantages and application of Fiber Optic communication. 4.5 Nature of light, its properties, 4.6 Definition and concept of Reflection, refraction dispersion, diffraction, absorption, Total internal reflection (TIR) and scattering of light ray. 4.7 Propagation of light in optical fiber, 4.8 Ray model, Theoretical approach to Wave model, 4.9 Snell's law, definition and concept of Critical angle, numerical aperture, acceptance angle and

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
		acceptance cone - (Numerical on above concepts)
Unit- V Optics Theory & Optic losses	5a. Explain the construction of fiber. 5b. Compare the working of the optical fiber for the given index profiles. 5c. Explain the types of Connectors & Splices in fiber. 5d. Explain the signal degradation & various losses in fiber. 5e. Explain operation of OTDR	5.1 Fiber materials. 5.2 Structure of fiber, Dimension of fiber. 5.3 Optical fiber classification based on : Modes and index profile 5.4 Modes of light propagation in fiber 5.5 Optical fiber connections: joints and couplers- Fiber alignment and joint loss, fiber splices, -fiber connectors. 5.6 Losses and signal degradation in optical fiber: Absorption loss, scattering loss, dispersion loss, Radiation loss, coupling loss, bending loss. 5.7 OTDR: block diagram, working principle, Functions and applications.
Unit- VI Optical Sources and Detectors	6a. Explain spontaneous & stimulated emission of radiation. 6b. Compare LED with LASER. 6c. Explain various characteristics of optical source. 6d. Explain the characteristics of optical detector.	6.1 Optical sources: LED, LASER, - construction and working, Characteristics, specifications & Comparison 6.2 Optical detectors: PIN diode, Avalanche photo diode- construction, working, Characteristics, specifications & Comparison.

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	**Introduction to Mobile Communication System.**	08	06	02	02	10
II	**Fundamental of Cellular system**	14	08	06	02	16
III	**Digital Cellular System**	10	06	06	02	14
IV	**Fundamentals of optical fiber communication systems**	14	08	06	02	16
V	**Optics Theory & Optic losses**	10	08	04	02	14
VI	**Optical Sources & Detectors.**	08	06	02	02	10
		64	**42**	**26**	**12**	**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 / Experiment Title	Approximate Hrs. Required
1	I	a. Identify different sections and components of mobile phone such as ringer section, dialer section, receiver section and transmitter section, camera, microphone speakers and light. b. Study & analyze the vibrator in a GSM handset. c. Study & measure the PWM signal of the vibrator.	02
2		a. To understand and perform charging of Handset. b. Study of Tx IQ/ Rx IQ signals c. Study of a SIM card in a GSM d. Study of the SIM card detection	02
3	II	a. Observe the signal and measure the voltages at input, output and different test points on the given trainer kit. b. To observe signal constellation of GMSK signal c. Study of GSM data rate & GMSK encoded signal	02
4		Perform practical using AT Commands for Receive the call, Make the call, Read Message, Send Message, Read the contents of the SIM, etc.	02
5	III	Visit nearby GSM based exchange and prepare a report of entire setup of their cellular system.	04
6		Visit nearby CDMA based exchange and prepare a report of entire setup of their cellular system.	04
7		To calculate NA of given optical fiber.	02
8		To set up fiber optic analog link.	02

9		To set up fiber optic digital link.	**02**
10	**V**	Identify various layers & parts of an optical fiber cable	**02**
11		Measure bending losses of the given fiber optic cable.	**02**
12	**VI**	Plot the characteristics of optical source & Detector.	**02**
13		Micro projects based on curriculum	**04**
		Total	**32**

Note : Perform Any 10 from given list.

8. SUGGESTED STUDENTS ACTIVITIES.

Other than the classroom and Laboratory 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: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Visit nearby MTNL/BSNL exchange and prepare detail report of entire setup of their cellular system.
b. Visit nearby CDMA based cellular switching center and prepare details of the entire setup of their cellular system
c. Demonstrate the general steps to repair Mobile handset.
d. Prepare a detail list of equipment and software required to troubleshoot the mobile handset.
e. Visit any industry nearby to your house/college and observe the use of optical devices.
f. Write the specification of various optical devices used in the industries.
g. Do internet survey for various optical fiber cables available in market.
h. Observe various splicing techniques used in industries

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

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

a. Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
b. Different types of teaching methods and media that are to be employed to develop the outcomes.
c. About 15-20% of the topics/sub-topics which is relatively simpler or descriptive in nature is to be given to the students for self-directed learning and assess the development of the CO through classroom

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Books	Author	Publication
1	Mobile Cellular Lee, C. Y. William	Lee, C. Y. William	Mcgraw Hill Education, New Delhi.
2	Wireless Rappaport	S.Theodore	Pearson publication New Delhi.
3	Advance Electronic communication Systems	Tomasi Wayne	Pearson Eduacation, New Delhi .
4	Fiber Optic Communication	Keiser, Gerd	McGraw Hill New Delhi
5	Optical Fiber communications principles & Practices	Senior, John M.	Pearson Education Ltd., New Delhi
6	Mobile and Personal Communication Systems and Services	Rajpandya	Prentice-Hall India

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED

- Mobile Phone Trainer kit: Cellular System : EGSM/GSM 900/ 1800 MHz
- (3GDualband),Rx frequency band (Downlink): EGSM 900 : 925-960 MHz 8,
- GSM 900 : 935- 960 MHz GSM 1800 : 1805-1880MHz
- Tx frequency band (Uplink) : EGSM 900 : 880- 890MHz
- GSM 900 : 890- 915 MHz GSM 1800 : 1710-1785MHz
- Output power : +5 ,+33 dBm / 3.2 mW . Channel spacing : 200 KHz Display : TFT, 256 K colours,128X 160 Pixels, 2.0", SIM support : Smart 7 » PF Tic. Dual SIM, Dual stand by (both GSM),Battery type : Li-Ion 1000m AH hes ie :
- 208 MHz,Sound : Speaker and Earphone Jack (3.5 mm) On ’ board sections : ie Dual he Ce Circuit, Clock, User interface.
- Fiber optic trainer kit.
- OTDR.

12. LEARNING WEBSITE & SOFTWARE

- www. philadelphia.edu.jo/newlibrary/.../filel 0fe6e5c77£4675b2958dc10a8c99c9. Pdf

- Mobile network standards:- https://gallucci.net/blog/gsm-cdma-and-Ite-a-guide-to-
- mobile-network...
- www.mobilecellphonerepairing.com » Mobile Phone Repairing Tools
- http://www.bbcmag.com/2008issues/june08/BBP_June08_OtoL.pdf
- virtual lab :- http://iitg.vlab.co.in/?sub=59&brch=269

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	PSO1	PSO2	No. of hours allocated in curriculum
CO1	Troubleshoot mobile handsets.	3	3	1	3	-	-	1	-	-	08
CO2	Assess cellular systems capacity.	3	3	1	1	-	-	-	-	-	14
CO3	Assess performance of standards of different cellular mobile systems	3	3	-	-	-	-	-	-	-	10
CO4	Interpret the functions of the various blocks of optical fiber communication system.	3	3	-	1	-	-	-	-	-	14
CO5	Measure the optical fiber cable parameters	3	3	-	1	-	-	-	-	-	10
CO6	Analyze losses in optical fiber communication system	2	2	1	1	-	-	-	-	-	08
COURSE	**Total strength**	**3**	**3**	**1**	**1**	-	-	-	-	-	**64**

COURSE CURRICULUM DEVELOPMENT COMMITTEE

Mr.D.D Ahirrao, Head, Department of Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad.
Mr. G.G.Vaishnav, Lecturer , Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad

Mr.A.D. Dabhade Lecturer , Electronics and Telecommunication Engineering, Government Polytechnic, Aurangabad

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HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE : PROJECT –II
COURSE CODE : 6X502

Diploma Programmes in which this course is offered	Semester in which offered
Electronics & Telecommunication	**SIXTH**

1. RATIONALE

provide an opportunity to the students for applying the knowledge and technical skills acquired by identifying real life problem of the industries /research organization / society as a whole and providing it's innovative solution with partial implementation , which is economically and technologically viable.

2. COMPETENCY

Project is to be selected by the students and the problem is to be identified for providing solution under the mentoring of the institute Guide and the Industry mentor to develop following competencies…

i. Co-creation & Interpersonal abilities
ii Design & Troubleshooting
iii Programming/simulation/ debugging skills
iv Developing PCB design/soldering skills
v Documentation & Presentation skill

3. Course Outcomes

At the end of the course, student will able to

i. Create familiarity with the industry personnel & industrial environment as well as processes.
ii Survey the related literature.
iii Define the problem and the objectives of the project.
iv Suggest various design alternatives and justification of the selection of the design methodology for the problem solution along with design specifications.
v Modeling and analysis of the proposed solution.
vi. Simulate, Design and debugging of the circuit
vii Partial Implementation of the proposed solution
viii. Develop program logic of the proposed solution
ix. Locate the problem and troubleshoot.
x. Work in team cohesively & effectively
xi Prepare project report having organized documentation.
xii. Prepare & deliver presentation.
xii. Enhance awareness for latest technologies and tools
ix. Visualize the roadmap of the further development.

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**	**PA**	**ESE# (OR) EXTERNAL**	**PA**	
0	0	4	04	--	--	50	100	**150**

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

5. COURSE DETAILS

Stage	Major Learning Outcomes	Topics and Sub-topics
Stage-I Searching of Project	1.a. Interact with the industry/research organization personnel 1.b. Gathering information and organize the information	1.1 Information gathering through websites and media. 1.2Identification of Industry/research organization 1.3 Visit to the Industry/research organization 1.4 Creating awareness about the industrial premises , personnel , processes and products 1.5 Review of literature
Stage– II Problem Definition & Submission	2.a. Define & explain Problem definition 2.b. Prepare & submit problem definition	2.1 Defining problem in consultation with your guide OR industry mentor 2.2 Preparing problem definition statement in the prescribed format and submit in soft and hard copy.
Stage– III Design Solution	3.a. Conceive and draw General block diagram of solution . 3.b. Develop circuit diagram in detail. 3.c. Write algorithm and draw flowchart	3.1 Block Diagram of project 3.2 Draw & Develop circuit diagram using circuit design softwares/tools 3.3 Development of algorithm and flowchart if applicable.
Stage – IV Hardware/ software simulation	4.a. Design PCB Layout 4.b. Simulate circuit 4.c. Assemble circuit 4.d. Test the Hardware	4.1 PCB Layout preparation using software tools 4.2 Circuit simulation 4.3 Partial implementation using

and partial **Implementation**	circuit 4.e.Troubleshoot the hardware circuit .	Breadboard or General purpose PCB 4.4 Test and troubleshoot hardware if applicable.
Stage - V Documentation & Presentation	5.a. Prepare project report 5.b. Prepare PPT presentation 5.c. Present project work	5.1Prepare project as per guideline 5.2 Prepare PPT as Schedule.

*Note: Searching of Project (Two weeks - Immediately after completion of Sem-V End Semester Exam)

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

Unit No.	Unit Title	Contact Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Searching of Project					
II	Problem Definition & Submission					
III	Design Solution					
IV	Hardware/software simulation and partial Implementation					
V						
	Total					

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 LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i. Prepare and submit project definition document in prescribed format.

ii. Visit industry regularly.

iii. Get help from innovative council, Guide/research organization for design solution.

iv. Report regarding stage wise progress to institute guide/industry mentor regularly.

v. Continuous practicing of latest circuit design and simulation tools/software.

vi. Study of intellectual property rights for patenting the project.

8. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. One day IDP awareness workshop.
ii. Industry survey.
iii. Seminar/Symposium
iv. Group discussion/Debate
v. Expert lectures of resource persons from industries/research organizations.
vi. Arranging Industrial visit.

9. SUGGESTED LEARNING RESOURCES

A) List of Magazines.

i. Electronics for you.

ii. Electronic design news.

iii. Elector electronics.

iv. Electronics project manuals

B) List of Major Equipment/ Instrument with Broad Specifications

1) Computer
2) Digital storage oscilloscope (DSO).
3) Spectrum analyzer.
4) Universal programmer.
5) Wide band function generator.
6) Soldering station with drill machine
7) PCB formulation kit
8) Clip on meter/ Multimeter / Power Supplies /
9) IC Tester / Continuity Tester /Component Tester
10) LCR Q –meters
11) Other equipments as per the need of project work.

C) List of Software/Learning Websites

http://www.electronicsproject.org
http://www.circuiteasy.com
http://www.electronics-project-design.com
http://www.electronicsschematic.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Dr. R G Wadekar,** HOD, Department of Electronics, Govt. Polytechnic, Aurangabad(MS)
- **S. D. Nimbekar**, Lecturer, Department of Electronics & Telecomm Engg, Govt. Polytechnic, Aurangabad(MS)

Faculty Members from NITTTR Bhopal

- Prof. R.G. Chouksey, Professor Department of Vocational Education and Entrepreneurship Development. NITTTR Bhopal
- Dr. Nishith Dubey, Professor, Department of Vocational Education and Entrepreneurship

OURSE TITLE : RELIABILITY AND QUALITY MANAGEMENT
COURSE CODE : 6X510

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	Sixth

1. RATIONALE

Life of the component and useful life of electronics system has vital role in the industry. Reliability of the device is an essential component to decide the life cycle. Reliability engineering covers all aspects of a product's life, from its conception, subsequent design and production processes, through use of its practical lifetime, with maintenance support and availability. Reliability engineering assessment is based on the results of testing from in-house (or contracted) labs and data pertaining to the performance results of the product in the field. The critical applications with which many modern products are entrusted make their reliability a factor of paramount importance.

2. COMPETENCY

Estimate reliability of regulated power supply.

Predict faults in a system using fault tree analysis.

3. TEACHING AND EXAMNATION SCHEME

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

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

1. Realize the reliability Concept.
2. Extract relevant information of system for data analysis.
3. Apply the Reliability prediction and improvement methodology.
4. Apply the methodology to analyze the faults.
5. Elaborate TQM principles.
6. Compare the quality and management tools.

5. DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Reliability Concept**	1a. Define reliability. 1b. Specify importance of reliability 1c. Describe function of MTBF and MTTF 1d. Explain function of Bath tub curve 1e. Realize the reliability Concept.	1.1 Definition of reliability 1.2 Importance of reliability 1.3 Classification: 1.3.1 Life of components 1.3.2 Failures of components 1.4 Reliability function 1.5 Failure rate 1.6 Mean time between failures (MTBF), Mean time to failure (MTTF) 1.7 A priori and a posteriori concept Bathtub curve – useful life.
Unit –II **Failure Data Analysis**	2a. Define Time to failure distributions 2b. Find out the life of the system using Weibull analysis 2c. Find out the ranking of data 2d. Extract relevant information of system for data analysis. 2e. Collect data from field	2.1 Time to failure distributions 2.2 Exponential, normal, Gamma, Weibull analysis 2.3 Ranking of data 2.4 probability plotting techniques 2.5 Case study of simple Regulated Power supply using discrete components.
Unit-III **Reliability Prediction Models**	3a. Understand Reliability prediction model 3b.Importance of Standby system 3c.Justify importance of fault tree analysis 3d.Write Methodology for fault tree analysis	3.1 Series and parallel systems 3.2 RBD approach 3.3 Standby systems 3.4 Application of Bayes' theorem 3.5 Cut and tie set method 3.6 Fault Tree Analysis- Case study of simple Regulated Power supply using discrete components.

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit - IV **Reliability Improvement**	4a. Elaborate importance of Redundancy 4b. Show improvement in Reliability with series and parallel configuration 4c. Specify importance of standby arrangements	4.1 Improvement of components: Redundancy 4.2 Stand by with perfect and imperfect switching, 4.3 Comparison of component redundancy to system 4.4 System reliability improvement 4.5 Series - Parallel and Mixed configurations with example
Unit - V **Availability & Maintainability of System**:	5a. Specify importance of maintenance 5b. Describe diagnosis procedure 5c. Elaborate necessity of Pre-votive maintenance for Electronic and Communication Systems 5d. Apply the methodology to analyze the faults.	5.1 Types of availability and factors affecting it. 5.2 Concept and definition of maintainability, 5.3 objective of maintenance, 5.4 classification of maintenance 5.5 factors effecting maintenance levels, 5.6 Methodology of fault diagnosis 5.7 Pre-votive maintenance schedules for Electronic and Communication Systems [Case study: B/W TV system (block diagram level)]

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	Reliability Concept	08	04	02	02	14
II	Failure Data Analysis	08	02	02	02	16
III	Reliability Prediction Models	10	02	03	04	16
IV	Reliability Improvement	14	02	02	04	22
V	Availability & Maintainability of System:	08	02	03	04	12
	Total	**48**	**14**	**14**	**20**	**80**

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

7. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Try to use reliability based software for analysis
2. Students must be encouraged for self directed learning to improve LOs/ COs.

8. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Total Quality	Joel E. Rose,	Management2nd Edition, Kogan Page Ltd., USA 1993.
2	Reliability Engineering	Srinath. L.S	Affiliated East West Press, New Delhi 1995.
3	Reliability engineering	A.K. Govil	Tata McGraw-Hill New Delhi
4	Total Quality Management	Dale H. Bester	Pearson Education India
5	Reliability Engineering	Balagurusamy E.	Tata McGraw- Hill New Delhi

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

10. LEARNING WEBSITE & SOFTWARE

a. www.youtube.com. (lectures on Reliability and TQM)
b. www.howstuffworks.com
c. www.alldatasheet.com
d. Electronics Work bench **e.** Reliability software

11. 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
CO1	Realize the reliability Concept.	2	3								3		3		08
CO2	Extract relevant information of system for data analysis.	2	3	3	3						3		3		08
CO3	Apply the Reliability prediction and improvement methodology.	2	3	3	3						3	3	3		14
CO4	Apply the methodology to analyze the faults.	2	3	3	3						3	3	3		10
CO5	Elaborate TQM principles.	2	3								3		1		04
CO6	Compare the quality and management tools	2	3								3		2		04
	Total strength	2	3	2	1						3		2		48

Course Curriculum Design Committee

Dr. S. B. Dhoot, Department of Electronics and Telecomm Engineering, Govt. Polytechnic, Aurangabad.

(Member Secretary PBOS) **(Chairman PBOS)**

COURSE TITLE : **ELECTRONIC PRODUCT DESIGN**

COURSE CODE : **6X511**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	SIXTH

1. RATIONALE

. The course intends to provide an overview of signal analysis. This course relies on elementary treatment and qualitative analysis of electronics circuit. It explores product design, development stages and total coverage of product assessment by introducing the basics of design and quality of electronic product to the student, as per the need of industry. Qualitative knowledge of electronics circuit and product design can lead to discussion of the various modes and causes of failure.

2. COMPETENCY

Realize product design of the given electronic system.

3. TEACHING AND EXAMNATION 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)@ INTERNAL	PA	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2		

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

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I. Relate the basics of prototyping, economic analysis, project planning and execution Processes.

II. Design a product using composite (Ergonomic and Aesthetics) design.

III. Analyze the process of collecting information and developing product specifications.

IV. Identify the process to plan and develop products.
V. Implement the concept of generation, selection and testing processes.
VI. Compare and relate the product architecture, industrial design and design for manufacture

5 .DETAILED COURSE CONTENTS

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Electronic Product Design**	1a. Understand concept of product Design. 1b. Identify basic principal of design of the electronics circuit. 1c. Understand the anatomy of product design. 1d. Relate the basics of prototyping, economic analysis, project planning and execution Processes.	1.1 Overview of Electronic Product Design. 1.2 Top-Down and Bottom-Up Approach considering Power Supply Design as an example, 1.3 Electronic Product Design Elements, Principles, planning, Process and Design Methodology. 1.4 Anatomy of Design Process.
Unit –II **Ergonomics and Aesthetics in Electronic Product Design**	2a. Understand the basics of ergonomics. 2b. Elaborate ergonomic issues in designing electronic products. 2c.Understand the aesthetics issues in designing electronic products. 2d. Design a product using composite (Ergonomic and Aesthetics) design. 2e. **Analyze the process of collecting information and developing product specifications.** 2f.**Implement the concept of**	2.1 Ergonomic definition with example. 2.2 Ergonomic issues in designing electronic products. 2.3 Design of controls and display with ergonomic consideration. 2.4 Aesthetics: Definition with example. 2.5 Aesthetics issues in designing electronic products. 2.6 Design of controls and displays with aesthetics consideration. 2.7 Composite (ergonomic and

	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	generation, selection and testing processes. 2g.Compare and relate the product architecture, industrial design and design for manufacture.	aesthetics) design consideration.
Unit-III **Control** **Panel Design**	3a.Understand the Types of Controls. 3b.Design, plan and organize control panel with engineering considerations. 3c.Understand the layout of components, selection of materials and their process. 3d.Describe the procedure of structural design and control cabinet fabrication. 3e.Identify the process to plan and develop products.	3.1 Types of controls, design and organization of control. 3.2 Panel engineering considerations 3.3 Layout of components, selection of materials. 3.4 Sheet metals and plastic processes 3.5 Surface finishing control, mountings (Engineering Considerations). 3.6 Structural design and control cabinet fabrication.

	Major Learning Outcomes (in cognitive domain)	**Topics and Sub-topics**
Unit - IV **PCB design and Testing**	4a.Understand the basic rule and principle of PCB designing. 4b.Compare single sided and double sided PCBs. 4c. Find procedure of multilayer component assembly. 4d.Understand the basic concept of grounding and shielding.	4.1 Layout, PCB sizes, General rules & parameters. 4.2 Recommendations for decoupling & bypassing. 4.3 Design rules for digital circuit PCB & analog circuit PCBs. 4.4 Noise generation, Supply & ground concept. 4.5 Multilayer board Component assembly & testing of assembled PCB , Bare board testing 4.6 Component assembly techniques. 4.7 High speed PCB design and points to be considered for designing the high speed PCBs. 4.8 Mounting in presence of vibrations. 4.9 Board layout check list. 4.10 Basic aspects of grounding and shielding.
Unit - V **Thermal Design Consideration**	5a.Describe thermal management of electronic equipment . 5b. Understand procedures of thermal design at component level, board level and system level. 5c. Design a Heat Sink.	5.1 Thermal management of electronic equipment. 5.2 Thermal design consideration at component level, board level, system level. 5.3 Fans and system operating characteristics. 5.4Heat sink design.

5. 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	Electronic Product Design	08	04	02	02	14
II	Ergonomics and Aesthetics in Electronic Product Design	08	02	02	02	16
III	Control Panel Design	10	02	03	04	16
IV	PCB design and Testing	14	02	02	04	22
V	Thermal Design Consideration	08	02	03	04	12
	Total	**48**	**14**	**14**	**20**	**80**

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

6. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	**Practical Exercises** (Outcomes in Psychomotor Domain)	Approx. Hrs. required
01	Prototype Electronic Product Design and Development (cabinet design) for Regulated Power Supply	08
02	Design of Traffic Light Controller A] Using Hand Made Model, B] Software Packages etc.	12
03	Design the schematic layout and testing of Regulated Power Supply Using PCB software	12
Total Practical Hours		32

7. SUGGESTED STUDENTS ACTIVITIES.

Collect the information for freeware software used for simulating the electronics circuit

8. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

Try to use Electronics circuit simulation software for analysis of electronics circuit (Analog / Digital)
Students must be encouraged for self directed learning to improve LOs/ Cos.

9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Electronic Product Design	V.S. Bagad	Technical Publications.
2	Product Design and Manufacturing	A. K. Chitale, R. C. Gupta	PHI Learning Pvt. Ltd.
3	Printed Circuit Boards: Design, Fabrication, Assembly and Testing	R. S. Khandpur	Tata McGraw- Hill, New Delhi
4	PCB design & Technology	Walter C Bosschard	Tata McGraw- Hill, New Delhi
5	Electronic Materials Handbook: Packaging	Merrill L. Minges	ASM International

10. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :-NIL

11. LEARNING WEBSITE & SOFTWARE

a. www.youtube.com. (lectures on Electronics Product Design)
b. www.howstuffworks.com
c. www.alldatasheet.com
d. Electronics Work bench.com

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
CO1	Relate the basics of prototyping, economic analysis, project planning and execution Processes.		3	3									3		08
CO2	Design a product using composite (Ergonomic and Aesthetics) design.		3	3								3	3		08
CO3	Analyze the process of collecting information and developing product specifications.		3	3									3		10
CO4	Identify the process to plan and develop products.		3	3								3	3		14
CO5	Implement the concept of generation, selection and testing processes.		3	3								3	3		08
CO6	Compare and relate the product architecture, industrial design and design for manufacture.		3	3									3		
	Total strength		3	3								2	3		**48**

Course Curriculum Design Committee

Dr. S. B. Dhoot, Department of Electronics and Telecomm Engineering,
Govt. Polytechnic, Aurangabad.

HOD ET (Chairman, PBOS) Co-ordinator(CDIC)Member Secretary

COURSE TITLE- EMBEDDED SYSTEMS

COURSE CODE 6X512

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**SIXTH**

1. RATIONALE

In the age of computer we are surrounded by the embedded systems at home, office, colleges; in the form of toys, cell phones, home appliances and as in aerospace technology, military applications. Out of millions of processors manufactured every year, nearly 95% processors are used in embedded system. Most of them are real time Embedded systems. To add luxury to any product, full automation is required and for that we need embedded system, where we don't need user intervention. By learning this course students can develop their own embedded system which is application specific to solve given real time problem by using open source platform. Thus this course is an important course for students who want to work in the automation sector of electronic industry.

2. COMPETENCY

Develop embedded systems for given application.

3. TEACHING AND EXAMNATION 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)@ INTERNAL**	**PA**	150
3	0	2	5	80	20	25	25	
	Exam Hours			3	1	2		

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

a. Select appropriate family of microcontroller for different application.
b. Interface relevant hardware for given application.
c. Develop program for given application.
d. Integrate hardware and software of an embedded system for given application.
e. Differentiate between general purpose computer and embedded system understanding architecture of RTOS
f. Differentiate and decide the architecture of processor for a specific application.

5. DETAILED COURSE CONTENTS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –I **Overview of Embedded System**	1a. Define basic concept of Embedded system. 1b. Specify Characteristics of Embedded system. 1c. Identify applications of embedded system	1.1 Embedded system: Definition, Characteristics of Embedded system 1.2 Applications of embedded system 1.3 Types of Embedded system 1.4 Differentiate between general purpose computer system and embedded system.
Unit –II **Architecture of embedded system**	2a. Identify hardware components of Embedded system 2b. Understand layers of operating system 2c. Compare types of embedded Operating systems 2d. Select operating system for a particular application 2e. Select the processor 2f. Describe hardware architecture of embedded system with its block schematic	2.1 Hardware architecture: CPU, memory, clock circuitry, watchdog timer, reset circuit, chip select, I/O devices, debug port, communication Interfaces, Power supply unit . 2.2 Types of Architecture of Embedded Processors: Von Neumann, Harvard, Super Harvard, RISC, CISC, DSP, Multi core processor. 2.3 Software architecture operating system, application software, task performed by embedded operating system. 2.4 Architecture of embedded operating system: kernel, device manager, communication protocol software, libraries, file system. 2.5 Types of embedded O.S: Non real time O.S, Real time O.S, Mobile O.S.

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit –III **Communica-tion protocols**	3a. Compare synchronous and asynchronous communication 3b. Compare serial and parallel Communication. 3b Select a serial bus protocol for specific application. 3c. Compare features of parallel bus Protocols.	3.1 Synchronous and Asynchronous communication, Parallel and serial communication. 3.2 RS232- DB9(pin functions), Max 232. 3.3 Serial bus communication protocols : CAN bus, I^2C bus, USB, Firewire, Advanced serial high speed buses. 3.4 Parallel bus device Protocols : ISA, PCI, PCI X. 3.5 Wireless communication Protocol: Bluetooth , Zigbee.
Unit-IV **Inter process communica-tion**	4a. Understand inter process communication functions. 4b. Use inter process communication Functions. 4c. Differentiate between Process, threads and task.	4.1 Multiple Processes in an application, Multiple threads in an application. 4.2 Tasks, Task states. 4.3 Concept of semaphores : Use of a semaphore as an event signaling variable, use of semaphore as a resource key, Mutex, use of multiple semaphores for synchronizing tasks. 4.4 Signal function, Semaphore functions, Message Queue functions. 4.5 Mailbox functions, Pipe functions.
Unit - V **RTOS**	5a. Understand structure of RTOS 5b. Describe functions of RTOS 5c. Compare scheduling algorithms 5d. Classify RTOS 5e. Compare OS with RTOS	5.1 Structure of RTOS : layered model of the system. 5.2 RTOS functions: Process management, file management, device management, I/O management, Interrupt and control mechanism. 5.3RTOS task scheduling models: Cooperative scheduling model, round robin, preemptive, non preemptive, first in first out, shortest job first. 5.4 Types of RTOS : hard and soft. Comparison of OS and RTOS

`	**Major Learning Outcomes** (in cognitive domain)	**Topics and Sub-topics**
Unit - VI **Testing and debugging tools for embedded system**	6a. Identify testing tool 6b. Understand the function of Logic analyser 6c. Select appropriate testing tool 6d. Maintain a microcontroller based system	6.1 Testing on host machine. 6.2 Simulators : Design development process, simulator features, features of VxSim. 6.3 Laboratory tools : Simple LED tests and logic Probe, Bit rate meter, Logic Analyzer, In circuit Emulator , monitor.

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	**Overview of Embedded System**	04	04	04	04	12
II	**Architecture of embedded system**	08	04	06	06	16
III	Communication protocols	10	06	06	04	16
IV	Inter process communication	10	04	04	04	12
V	RTOS	10	02	06	06	14
VI	Testing and debugging tools for embedded system	06	04	02	04	**10**
	Total	**48**	**24**	**28**	**28**	**80**

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

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

S. No.	**Practical Exercises** (Outcomes in Psychomotor Domain)	**Approx. Hrs. required**
1	Select an embedded system to be developed	2
2	Develop the block diagram of the system	2
3	Identify the hardware components to be used in the system	2
4	Draw the circuit diagram.	2
5	Develop software for the system.	6
6	Assemble the components	4
7	Test the developed hardware	6
8	Download the software	2
9	Test the developed embedded system.	6
	Total	32

8. SUGGESTED STUDENTS ACTIVITIES

Following is the list of proposed student activities like:

Prepare a report based on developed system.

Find Specifications and package of embedded processor used in the system.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i.Students should be shown animations/video films to explain the working concept of different types of microcontrollers, applications of embedded systems, software tools, communication protocols, etc.

ii. Students must be encouraged for self directed learning to improve LOs/ Cos.

10. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1	Embedded Systems	Rajkamal	Tata McGraw- Hill Education Private Ltd.
2	Embedded/ Real time systems	Prasad	Dreamtech Press

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

1. . Personal computer
2. Integrated development Environment
3. Universal programmer
4. **Testing tools**

12. LEARNING WEBSITE & SOFTWARE

a. www.nptel.iitm.ac.in
b. www.youtube.com. (lectures on embedded systems)
c. www.howstuffworks.com
d. www.alldatasheet.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 curricu
CO1	Select appropriate family of microcontroller for different application.	0	3	0	3							2			
CO2	Interface relevant hardware for given application	0	3	0	3							2			
CO3	Develop program for given application.	0	3	3	3							3			
CO4	Integrate hardware and software for embedded system for given application.	0	3	0	3							3			
CO5	Differentiate between general purpose computer and embedded system, understanding architecture of RTOS	0	3	0	3										
CO6	Differentiate and decide the architecture of processor for a specific application	0	3	0	3										
	Total strength		**3**	**1**	**3**							**2**			

Course Curriculum Design Committee

V.G.Mahendra, Lecturer , Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad

Dr. S.D.Yardi, Lecturer, Department of Electronics and Telecommunication Engineering ,Government Polytechnic , Aurangabad.

(Member Secretary PBOS) (Chairman PBOS)

Z ``````````COURSE TITLE: DIGITAL SYSTEM DESIGN USING VHDL

COURSE CODE : 6X513
PROGRAMME & SEMESTER

Diploma Program in which this course is offered	Semester
ELECTRONICS & TELECOMMUNICATION ENGINEERING	**Sixth**

1. RATIONALE

Digital integrated circuits are integral part of electronic equipment/ gadgets starting from small toys to complex computer systems including personal digital assistants, mobile phones and Multimedia agents. This course will enable the students to acquire the basic skills to develop codes for Digital System Design through VHDL programming. This course will also enable them to use FPGA and ASIC chips for design and development of processors, various applications.
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2. COMPETENCY

Develop codes through VHDL programming for digital systems.

3. TEACHING AND EXAMNATION 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) (External)	PA	
3	0	2	5	80	20	25	25	150
	Exam Hours			3	1	2	--	

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

I Identify governing technology in a digital system.
II Program simple NOT Gate.
III Develop VHDL program logic for CLS.
IV Develop VHDL program logic for SLS.
V Design a Memory system.
VI Use FPGA/ PLD's, PAL (ALU), ASIC for simple logic design.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
UNIT-I **Introduction to VHDL**	1a. Introduce digital Systems, different types of digital systems, Structure, Function. 1b. Describe Design process 1c. Explain Structure of VHDL 1d. Classify Operators and Data Types of VHDL	1.1 Digital System Structure, Types of digital systems, Classification of IC technology, design process, Basic design loop, Introduction to CAD tools. 1.2 Structure of VHDL module: Libraries, Entity, Architecture. 1.3 Operators of VHDL: Arithmetic, Logical, Relational, Shift and Rotate 1.4 Data types of VHDL: Signal, Variable, Constant. 1.5 Comparison between VHDL and Verilog.
UNIT-II **VHDL modeling styles**	2a Get familiarized with VHDL Programming methodology. 2b Describe steps involved in implementation 2c Compare Concurrent and Sequential signal assignment statement.	2.1 VHDL modelling of digital systems: Classification of modelling. 2.2 Dataflow description: structure, signal declaration, signal assignment statement, concurrent signal assignment statement, constant declaration and assignment statement, assigning delay to the signal, conditional signal assignment

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
	2d Learn techniques of Assigning delay 2e Program simple NOT Gate.	(when….else), selective signal assignment (with….select) 2.3 Behavioral description: structure, variable assignment, sequential statement for VHDL; if statement, case statement, loop statement, signal and variable assignment, procedure and function statement. 2.4 Structural description: Organization of structural design, component declaration and instantiation, binding methods.
UNIT-III **Digital system design: CLS**	3a Explain objectives and flow of digital system design 3b Define design hierarchy terms and explain architecture of a system 3c Design a simple CLS 3d Develop VHDL Programs related to basic logic gates 3e Develop VHDL programs related to fundamental Arithmetic operations. 3f Develop VHDL programs related to combinational circuits. 3g Compare various synthesis tools for optimization	3.1 Combinational logic Systems [CLS] and design: Boolean algebra, K-map a. Basic gates, Universal gates and Exclusive gates. b. Adder, Subtractor, ALU c. MUX, DE-MUX 3.2 VHDL modeling and programming 1. Library Declaration 2. Entity 3. Architecture 4. Implementation 5. Synthesis tools 6. Test bench

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics (Containing POs and PSOs assignment in each Sub-topic)
UNIT– IV **Digital system design: SLS**	4a Compare design considerations in synchronous and asynchronous systems 4b Design simple SLS 4c Develop VHDL programs related to sequential circuits. 4d Design a Memory system	4.1 Sequential logic systems [SLS] and design: 1. Flip-flops – J-K, T, D. 2. Registers –shift right, left. 3. Counters –ripple, synchronous. 4. Design of Memory systems: RAM and ROM 4.2 VHDL modeling and programming 1. Library Declaration 2. Entity 3. Architecture 4. Implementation 5. Synthesis tools 6. Test bench
UNIT - V **Circuit Design of Digital Systems and Testability**	5a. Describe ASICs 5b. Develop programs for memory circuit and FPGA 5c. Highlight important design considerations of ASIC 5d. Design Testability	5.1 Introduction to ASIC: 1. FPGA 2. PLD 3. CPLD 4. PLA 5.2 Need of design for testability 5.3 Introduction to Fault coverage, need of boundary scan check, JTAG technology, TAP controller, BIST.

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	Introduction to VHDL	04	04	04	04	12
II	VHDL modeling styles	16	04	08	08	20
III	Digital system design: CLS	08	00	06	10	16
IV	Digital system design: SLS	10	00	08	08	16
V	Circuit Design of Digital System and Testability	10	00	08	08	16
	Total	**48**	**08**	**34**	**38**	**80**

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
*** Computer Software : Xilinx ISE WebPACK & ModelSim PE Student Edition http://www.xilinx.com/tools/webpack.htm http://www.model.com			
1.	II, III	Identify VHDL entities, coding styles.	16
		Simulate the basic logic gates using VHDL.	
		Simulate X-OR, X-NOR logic gates using VHDL.	
		Simulate Universal Logic Gates using VHDL	

S. No.	Unit No.	**Practical Exercises** (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Simulate Half adder using VHDL.	
		Simulate Full adder using VHDL.	
		Simulate Half Subtractor using VHDL.	
2.	II, IV	Simulate J-K Flip-flops using VHDL	12
		Simulate T Flip-flops using VHDL.	
		Simulate D Flip-flops using VHDL.	
		Simulate 3bit asynchronous counter using VHDL.	
		Simulate 3 bit shift register using VHDL.	
		Simulate 3 bit synchronous counter using VHDL	
3.	III, V	Simulate 16 –cell RAM / ROM	04
		Simulate FPGA/ CPLD/ PLA	
		CASE: Analysis of design, programming and synthesis of an ASIC	
4.		**Microproject:**	
Total			32

8. SUGGESTED STUDENTS ACTIVITIES

1.Survey Current requirement for some Hardware/ Chip application pertaining to your Company / Department/ Institute.
2.Identify basic Circuits.
3.Project- Build a small ASIC for your Home/ Community.
4.Provide more Hardware to enhance features and components of your ASIC.
5.Visit industries where systems/ equipment/ gadgets using VLSI are being assembled / manufactured.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

i. Arrange guided visits to automation industries.
ii. Motivate students to use internet for applications.
iii. Students may be helped to develop logic on individual basis.
iv. Show Video/ Animation film explaining system Design available on internet.
v. Arrange expert lecture on VHDL programming for real life applications.
vi. Students must be encouraged for self directed learning to improve LOs/ COs.

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9. SUGGESTED LEARNING RESOURCE

S. No.	Title of Book	Author	Publication
1.	HDL Programming Fundamentals VHDL and Verilog	Nazeih M. Botros	Thomson Learning Inc.
2.	Digital Systems Design Using VHDL, 2nd Edition	Charles H. Roth, Jr. Lizy Hurian John, Thomson.	
3.	Fundamentals of Digital Logic with VHDL	Stephen Brown, Zvonko Vranesic	TMH
4.	VLSI Design Theory and Practice	Vij Vikrant, Er. Syal Nidhi	Laxmi Publications Ltd.
5.	VHDL Programming by Example	Perry Douglas L.	MGH

S. No.	Title of Book	Author	Publication
6.	VHDL Modeling of Systems	Znawabi	TMH
7.	Circuit Design with VHDL	Pedroni V. A.	PHI

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

Sr.NO.	Name of the Equipment	Specification
1	Personal Computers with VHDL Software / programming facilities. (Separate computer for group of 02 students)	32.bit
2	VHDL trainer kits	
3	Multimedia projector, Tutorial Video CD (Programming in VHDL), Expert video lectures.	

11. LEARNING WEBSITE & SOFTWARE

i. Xilinx ISE WebPACK & ModelSim PE Student Edition
http://www.xilinx.com/tools/webpack.htm http://www.model.com
i. QUARTUS-II-ALTERA EVAL VERSION
iii. ModelSim® HDL simulator : for students to use in their academic coursework.
iv. ISE Simulator

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

CO. NO.	Identify governing technology in a digital system.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	No. of hours allocated in curriculum
CO1	Identify types of modelling systems.		1	2	3	3						**3**		04
CO2	Program simple NOT Gate.		2	3	2	3						**3**	3	16
CO3	Develop VHDL program logic for CLS.		3	3	3	3						**3**	3	08

CO4	Develop VHDL program logic for SLS.		3	3	3	3						**3**	3	10
CO5	Design a Memory system.		3	3	3	3						**3**	3	05
CO6	Use FPGA/ PLD's, PAL (ALU), ASIC for simple logic design.		3	3	3	3						**3**	3	05
	Total Strength		3	3	3	3						**3**	3	48

Course Curriculum Design Committee

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(Member Secretary PBOS) **(Chairman PBOS)**

INSTITUTE VISION

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

INSTITUTE MISSION

“ To educate and train globally competent individuals, professionals, technicians and skilled human resources through world-class curriculum, student centric academic systems, team of committed, trained faculty and staff contributing to the students, successful employment and entrepreneurship with a spirit of patriotism and concern for environment”

DEPARTMENT VISION

“To be a centre of excellence, assuring competitive technical manpower for emerging trends in the field of electronics & telecommunication *to address multidisciplinary sectors.* ”

DEPARTMENT MISSION

M1: Strengthen the knowledge & skills to convert concept, idea into system for employability/ entrepreneurship.

M2: Develop software skills needed in the field of electronics.

M3: Expose the students to industrial

M4: Build personality, teamwork spirit, professional ethics & social concern.