DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(First to Sixth Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

Electronics Engineering Department

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GOVERNMENT POLYTECHNIC, MUMBAI

VISION:

Transform knowledge into work.

MISSION:

We are committed for

1. Quality education for lifelong learning.

2. Need based educational programmes through different modes.

3. Outcome based curriculum implementation.

4. Development & up gradation of standard laboratory practices.

5. Promoting entrepreneurial programmes.

We believe in equality, safety, environment friendly practices & teaching learning innovations.

ELECTRONICS ENGG. DEPARTMENT

VISION:

Develop competent technician & practicing engineers in the field of electronics engineering.

MISSION:

To achieve our vision the department will update for continuous innovation, dedication to improve quality and provision of considerate facilities.

1. Deploying quality infrastructure & laboratory equipment.
2. Promote innovations in curriculum, teaching, learning & staff training.
3. Offering CEP & Community program.
4. Promoting Industry culture in work. Industry liasoning & enhancing employability.
5. Embracing changes & encouraging innovations in Electronics.

PROGRAMME OUTCOMES:

PO-1 Basic & Discipline specific knowledge: apply knowledge of basic mathematics, science and engineering fundamentals & engineering specialization to solve the engineering problems.

PO-2 Problem analysis: Identify & analyse well defined Engineering problems using codified standard methods.

PO-3 Design/ development of solutions: Design solutions for well defined technical problems & assist with the design of systems components or processes to meet specified needs.

PO-4 Engineering Tools, Experimentation & testing: Apply modern engineering tools & appropriate technique to conduct standard test & measurements.

PO-5 The engineering practices and society sustainability & environment: Apply appropriate technology in context of society, sustainability environment & ethical practices.

PO-6 Project Management: Use engineering management principles individually, as a team member or a leader to manage projects & effectively communicate about well defined engineering activities.

PO-7 Life-long learning: Ability to analyse individual needs & engage in updating in the context of technological changes.

PROGRAMME EDUCATIONAL OBJECTIVE:

PEO-1: To acquire a strong background in basic science and Mathematics and develop abilities to use these tools in electronics engineering.

PEO-2: To develop the ability to apply technical competence in the fields of electronics engineering.

PEO-3: To attain professional excellence through life-long learning.

PEO-4: To produce Engineers possessing ethical behaviour, moral character and professional qualities.

PROGRAM SPECIFIC OUTCOME:

PSO-1: Develop the ability to organize test set up and operate the equipment.

PSO-2: Analyse, implement, demonstrate and find the faults in the Electronic circuits.

PSO-3: Design and simulate electronic circuits and systems for solving real time problems and applications

Government Polytechnic Mumbai

Curriculum Philosophy

(P19 Outcome based Curriculum)

(Sandwich Pattern)

Preface

The quality of technical education is dependent on a well-developed curriculum.The curriculum should not focus only on technical contents but it should impart necessary skills that help students to learn how to copewith new challenges. It should prepare them for lifelong learning once they enter the workforce. It is very necessary that the diploma students should be well updated with the latest technological skills and advancements, to meet industrial demands and contribute to nation building. With this thought we have designed outcome based curriculum keeping in view the latest industry trends and market requirements. Outcome based curriculum will be offered to students 2019 onwards. Outcome based curriculum is student centric rather than teacher centric. It is comprising of basic science and engineering having focus on fundamentals, significant discipline level courses and electives. Six month Inplant training is also included in the curriculum to make the student understand industry requirements, have hands on experience and take up project work relative to industry in their final year. These features will allow the students to develop problem solving approach to face the challenges in real life.

In outcome based education, Programme Outcomes, Programme specific outcomes, Course outcomes are defined first and then course contents are designed to achieve these outcomes. During curriculum implementation the teacher will analyze the contents and then develop the learning experiences which will ensure accomplishment of outcome. The industry experts, being main stake holders are actively involved, while designing the curriculum. Outcomes are validated by industry experts, so it will produce industry ready pass outs and increase the employability of students.

Salient features of this curriculum are

- Outcome based curriculum with well defined outcomes for each course
- Incorporation of six month Inplant training
- Built in flexibility to the students in terms of elective courses
- Course on Entrepreneurship and Start-up to encourage entrepreneurial skills
- More weightage for practical's in terms of contact hours to increase skill component
- Student Centered Activity in first, second and third semester to inculcate the habit of physical and mental fitness right at the start
- One MOOCin each semester in order to inculcate self learning capability in students.

- A list of experiments with clear outcomes.

The New Curriculum has been designed to better meet the needs of the industry consideringevolving technological trends and implications for the engineering workforce.This curriculum is also expected to enhance employability skills and develop well trained Diploma Engineers who have theknowledge and the skills to get engineering solutions for real-world problems.

I gratefully acknowledge the time and efforts of all those who contributed to design the curriculum, especially the contributions of chairperson and members of Board of Studies and Programmewise Board of Studies. I acknowledge all the stake holders, aluminies and subject experts.

(Mrs. Swati Deshpande)
Principal
Government Polytechnic Mumbai

Outcome Based Education Philosophy

As the National Board of Accreditation (NBA)is focusing on the adoption of Outcome Based Education (OBE) approach, Government Polytechnic, Mumbai has adopted the OBE approach for design of curriculum P19 to all programmes. NBA adopted Outcome based Model because, OBE is "Student Centric" rather than "Teacher Centric". OBE focuses on the graduate attributes or outcomes after completing an academic programme. Outcome based approach means knowingwhat you want to achieve and then taking the steps to do so.Starting with a clear picture of what is important for students to be able to do and then organizing the curriculum delivery and assessment to make sure learning happens.

Some Benefits of OBE are

1. Satisfying the need of stake holders
2. More specific and coherent curriculum
3. Student centric

Components of the OBE are

1. Outcome based curriculum: What students should be able to do after learning the curriculum?
2. Outcome based Teaching Learning: Prepare and train the students to achieve the outcomes.
3. Outcome based assessment: Measure what the student has achieved? Indentify which outcome has not attained by the students.
4. Remedial measures: Take the remedial measures so that student can achieve that outcome.

Fig1. Outcome Based Education Philosophy

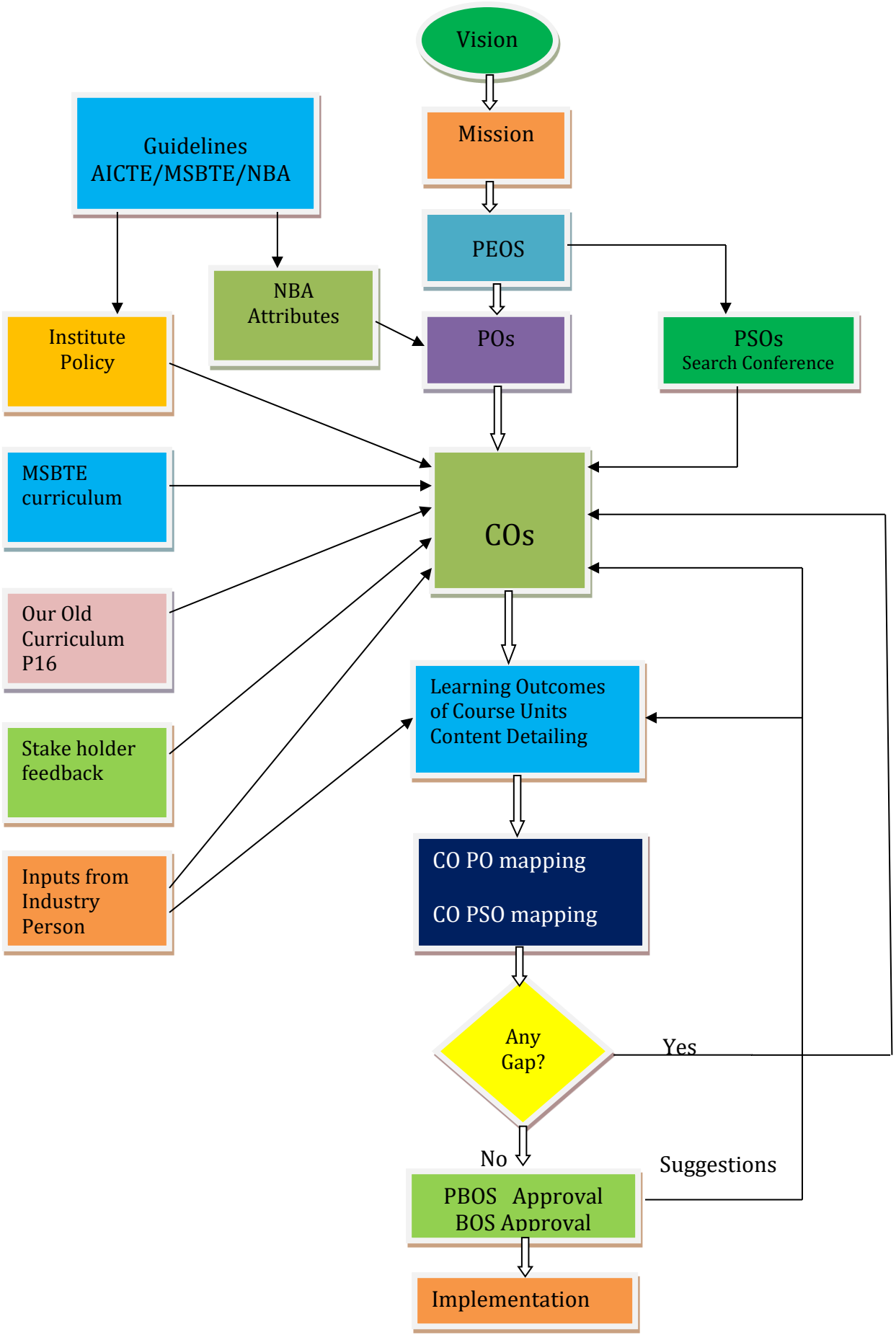

Fig. 2 Curriculum Design Process

Figure 1 shows outcome based education philosophy. Vision and mission statements willbe finalized first, and then each programme will finalize Programme educational objectives (PEOs). Programme outcomes (POs) are given by NBA. Each programme will finalize their Programme Specific Outcomes (PSOs). Then course outcomes (COs) are finalized and then content detailing of each course will be carried out.

Figure 2 shows our curriculum design process/philosophy. Figure is self explanatory. Important steps are given below. Process starts with formulation of vision mission statements of the institute.

1. Formulation of Vision Mission Statements

Vision Mission statements of the institute are finalized using following steps.

- Bottoms up approach
- Involvement all stakeholders
- Discussion, Brain storming sessions among all stake holders
- Gap analysis or SWOT analysis
- Challenges before the institute
- What are the immediate and long term goals

After following these steps vision and mission statements of the institute is finalized as

Institute Vision

Transform Knowledge into Work

Institute Mission

We are committed for

- Quality education for lifelong learning
- Need based educational programmes through different modes.
- Outcome based curriculum implementation
- Development and up gradation of standard laboratory practices
- Promoting entrepreneurial programmes

We believe in ethical, safety, environmental friendly practices and teaching learning innovations.

Once, the vision mission statements are finalized. Using the same procedure vision mission statements of each programmes are finalized.

2. Programme Educational Objectives (PEOs)

The Programme educational objectives of a diploma program are the statements that describe the expected achievements of diploma holders in their career, and also in particular, what they are expected to perform and achieve during the first few years after diploma. The PEOs, may be guided by global and local needs, vision of the Institution, long term goals etc.For defining the PEOs the faculty members of the program have continuously worked with all Stakeholders: Local Employers, Industry, Students and the Alumni

3. Programme Outcomes (POs)

Programme outcomes are given by NBA. They are

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyzewell defined engineering problems using codified standard methods**.**
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering tools experimentation and testing:** Apply modern engineering tools and appropriate technique to conduct standard test and measurements.
5. **Engineering practices for society sustainability and environment:** apply appropriate technology in context of society sustainability environment and ethical practices
6. **Project management:**Use Engineering Management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes

4. Programme Specific Outcomes (PSOs)

These outcomes are specific to a program in addition to NBA defined POs, namely, Civil, Computer, Electrical, Electronics, Mechanical, Information Technology, Instrumentation, Rubber Technology, Leather Technology, and Leather Goods and Footwear technology.

5. Course Outcomes (COs) and Content detailing

"Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course". Each course is designed to meet (about 4 to 6) Course Outcomes

The Course Outcomes are stated in such a way that they can be actually measured. "Blooms Taxonomy" is used for framing course outcomes.

Course Outcome statementsare broken down into two main components:

- **An action word** that identifies the performance to be demonstrated;
- **Learning statement** that specifies what learning will be demonstrated in the performance;

Once the COs are finalized, content detailing of each course is done as per the course outcomes. For content detailing inputs are taken from stake holders, MSBTE curriculum and industry persons.

6. CO-PO and CO-PSO mapping

When all COs are finalized, COs are mapped with POs and PSOs. During mapping if it is found that particular PO or PSO has not been addressed by any CO, then it is considered as gap. To remove this gap, again COs are modified. This process will repeat till all POs and PSOs are mapped by COs.

7. Approval in PBOS and BOS meetings.

After CO-PO and CO-PSO mapping, content detailing is done. Then the curriculum is kept for approval in Programme wise Board of studies (PBOS) meeting. Each programme has its own PBOS committee whose structure is as follows.

Head of Department concerned	Chairman
Two senior Lecturers	Members
One expert from the neighboring institute	Member
Nominee from the board of technical Education	Member

One expert from the local industry	Member
Departmental Curriculum Coordinator	Member Secretary

Suggestions given by PBOS members are incorporated in the curriculum and then it is put in front of Board of studies (BOS). Structure of BOS is as follows.

Representative from Industry	Chairman
Principal	Member
Head of All departments	Member
Local Experts of all programmes	Member
Nominee from the board of technical Education	Member
In charge CDC	Member Secretary

Suggestions given by BOS members are incorporated in the curriculum and the finalized curriculum is then offered to the students.

8. Institute Policies

As per the guidelines given by All India Council of Technical Education (AICTE), Maharashtra State Board of Technical Education (MSBTE), Directorate of Technical Education (DTE) and NBA, Institute policies about curriculum design are decided in the meeting of all Heads of the departments.

Being an autonomous institute, we revise our curriculum after every 4 to 5 years. Earlier it was revised in 2016. Curriculum 2016 was outcome based curriculum. As per instructions received from AICTE and NBA, Outcome based curriculumshould be offered to students,we have offeredOutcome based curriculumin 2016. In 2019, we have conducted search conference in all departments to identify set of skill components that should be developed in students at the end of the diploma programme. Here we got suggestions from industry experts as well as from stakeholders about incorporation of six month Inplant training in the curriculum itself to give awareness about industry culture to students. So in 2019 we revised our curriculum. It is outcome based with six months Inplant training. We got approval from AICTE also. So now all courses are sandwich pattern. This scheme we name as P19 scheme. In 2019 it will be offered to first year and in subsequent years it will be offered to second year and third year. Once the curriculum frame work is finalized at the institute level, as per the demand of the industry, course contents can be

changed at any level without disturbing the frame work. This is necessary to satisfy the present demand of the industry and remove the curricula gaps as per the advancement in technology.

2019curriculum is of 180 credits (215 teaching hours). As per AICTE norms given in APH 2015-16, contact hours per semester should be 525 hours and number of teaching days should be 75 in a semester (7 hours per day i.e. 35 hours per week). Total weeks for teaching are 15. One week will be for unit test exam. Total term will be of 16 week.

So we decided to design 2019 curriculum with 180 credits.

Definition of Credit:

1 Hr. Lecture (L) per week 1 credit

1 Hr. Tutorial (T) per week 1 credit

2 Hours Practical (P) per week 2 credit

All programmes (Civil Engineering, Computer Engineering, Electrical Engineering, Electronics Engineering, Information Technology, Instrumentation, Mechanical Engineering, Rubber Technology, Leather Technology, Leather Goods and Footwear Technology) have incorporatedsix month Inplant training in their curriculum, wherein students will go for Inplant training in the industries during last semester. 20 credits (40 teaching hours per week) are allotted for Inplant training.

Curriculum Framework

Semester wise Credit distribution and Mark distribution is given below.

Curriculum Frame work for All Programmes

Year	**Semester**	**Credits**	**Teaching hours**	**Marks**
First	**First**	30	35	600 to 700
	Second	30	35	600 to 700
Second	**Third**	30	35	600 to 700
	Fourth	35	35	700 to 800
Third	**Fifth**	35	35	700 to 800
	Sixth	20	40	200
Total		180	215	3400 to 3900

Apart from technical courses, in first 3 semesters, 5 teaching hours per week are allotted for Student Center Activities. Breakup of these five hours is as follows.

Library – 1 hr

Sports – 2 hrs

Creative arts – 2 hrs

In order to inculcate self learning capability in students MOOC (Massive Open Online Course) in each semester is incorporated in the curriculum of all programmes.

As per AICTE model curriculum 60% weightage is given for external examination and 40% weightage is given for internal examination as far as theory is considered. For all courses in all programmes 60+20+20 pattern of examination is followed. Two internal progressive assessment tests are conducted for theory courses in a semester having maximum marks 20. End semester examination of 60 Marks is conducted at the end of the semester. Addition of two test marks with end semester examination marks will give total marks out of 100.

After test as well as end term examination bitwise analysis of answer book of each student will be done in order to calculate course outcome attainment. From course attainment, PO and PSO attainment will be calculated. If attainment is not satisfactory remedial measures will be taken by respective department.

For courses, those they are having practical's, Term work is kept, where continuous assessment is made compulsory.

In the sixth semester, students are going for Inplant training. Before going into industry at least he/she should learn basic things required for his/her programme. In order to achieve this, a prerequisite of minimum 100 credits is must for registration of Inplant training. A student will be eligible for registration of Inplant training only when he/she completes minimum 100 credits.

Award of Diploma

For the award of diploma in all programmes, all courses of 5th semester and Inplant training will be considered along with weightage of third and fourth semester courses as shown in following table.

All courses of fifth semester	700 to 800 Marks
Inplant Training	200 Marks
Consolidated marks of third and fourth semester*	200 marks
Total marks	1100 to 1200 Marks

*Consolidated Marks of third and fourth semester – the total marks of third and fourth semesters are converted to 100 marks each. These marks are then added (3rdSem + 4thsem) as 100+100 = 200 marks.

Implementation of MOOC:

In each semester all programmes will offer a MOOC. Programme head should see that this MOOC is freely available to all students; it should not be financial bourdon on students. Sufficient number of lectures/sessions should be available for the course which is offered through MOOC. For 1 credit per week one lecture or one session of 45 minutes to 60 minutes should be available.

For MOOC courses online examination is conducted by service provider for example spoken tutorial. Spoken tutorial will issue certificates also. Programme head should collect certificates of all students semester wise and submit to controller of examination.

As exam is conducted by some other agency, marks are not taken into consideration. They will not reflect in the result. But unless and until student complete certification, credits of MOOC will not be awarded to the students. Without completion of 180 credits diploma will not be awarded.

Student can complete MOOC at any time throughout of this tenure of diploma. Course or exam registration of student in any semester will not be blocked due to incompletion of MOOC. Whenever student completes certification, in that term, in the result of term end examination credits will be allotted.

If a MOOC is performed through NPTEL, course is free but for getting certification, student has to pay extra fees. In such a case, to avoid financial bourdon on students, MCQ based examination of such courses will be conducted by respective departments and certification can be provided by respective department. For certification, passing criteria of 40% should be used.

Course Codes:

Entire curriculum of all Programmes is divided into five levels. These levels and their percentage is given below.

Level1- Science and Humanities (10 to 15%)

Level2- Core Technology (25 to 30%)

Level3- Applied Technology (45 to 50%)

Level4- Diversified Courses (5 to 10%)

Level5- Management courses (3 to 5%)

Course Coding Scheme:-

Course Code abbreviations	**Definitions**
HU	Humanities
SC	Science
MG	Management
CE	Civil
CO	Computer
EC	Electronics
EE	Electrical
IT	Information Technology
IS	Instrumentation
RT	Rubber
LT	Leather Technology
LG	Leather Goods and Footwear
ME	Mechanical Engineering

Course codes are formed as:

First two letters are course code abbreviations. Then two digits "19" refers to 2019 curriculum.

Next digit is level number and last two digits are serial number from that level.

For example: HU19101 (Communication Skill)

HU- It belongs to Level 1 Science & humanities

19- 2019 curriculum

1- Level 1

01- Sr. No of Level 1 courses.

Government Polytechnic Mumbai

Programme: Electronics Engineering (Sandwich Pattern)

180 Credit Scheme 2019

Level Code	Title of level	Course			Teaching Scheme				Credits	Marks
		CO	OP	Total	TH	PR	TU	Total		
1	Science & Humanities	5	0	5	14	4	2	20	20	550
2	Core Technology	9	0	9	23	26	0	49	49	1050
3	Applied Technology	5	0	5	11	54	0	65	45	825
4	Diversified Technology	10	2	12	27	36	0	63	63	1375
5	Management Courses	1	0	1	3	0	0	3	3	100
	Total	**30**	**2**	**32**	**78**	**120**	**2**	**200**	**180**	**3900**

Government Polytechnic Mumbai
Programme:- Electronics Engineering (Sandwich Pattern)

Title of level 1 : Science & Humanities.

Course Code	Course Title	C	O	Teaching Scheme				Credit	Examination Scheme						
				L	P	TU	Total		TH	TS1	TS2	PR	OR	TW	**TOTAL**
HU19101	Communication Skills	C		2	2	0	4	4	60	20	20	25*	0	25	150
SC19109	Basic Mathematics	C		4	0	0	4	4	60	20	20	0	0	0	100
SC19104	Physics	C		3	2	0	5	5	60	20	20	25*	0	25	150
SC19110	Engineering Mathematics	C		4	0	0	4	4	60	20	20	0	0	0	100
SC19112	Applied Mathematics	C		1	0	2	3	3	0	0	0	0	0	50	50
	Total	**5**	**0**	**14**	**4**	**2**	**20**	**20**	**240**	**80**	**80**	**50**	**0**	**100**	**550**

Title of level 2 : Core Technology Courses

Course Code	Course Title	C	O	Teaching Scheme				Credit	Examination Scheme						
				L	P	TU	Total		TH	TS1	TS2	PR	OR	TW	**TOTAL**
EC19201	Electronics Components and Workshop	C		3	4	0	7	7	0	0	0	0	50	50	100
EE19210	Fundamentals of Electrical Engineering	C		4	2	0	6	6	60	20	20	0	50	50	200
EC19202	Libre office Impress on BOSS Linux (MOOC)#	C		0	4	0	4	4	0	0	0	0	0	0	0
EC19203	Basic Electronics	C		3	4	0	7	7	60	20	20	25	0	25	150
EC19204	Circuit & Networks	C		3	2	0	5	5	60	20	20	25	0	25	150
EC19205	Electronic Measurement and Instruments	C		3	2	0	5	5	60@	20@	20@	0	25	25	150
EC19206	Digital Electronics	C		3	2	0	5	5	60	20	20	25*	0	25	150
EC19211	C and Cpp (MOOC)#	C		0	4	0	4	4	0	0	0	0	0	0	0
EC19208	Introduction to Communication	C		4	2	0	6	6	60	20	20	0	25*	25	150
	Total	**9**	**0**	**23**	**26**	**0**	**49**	**49**	**300**	**100**	**100**	**50**	**125**	**225**	**1050**

Title of level 3 : Applied Technology Courses

Course Code	Course Title	C	O	Teaching Scheme				Credit	Examination Scheme						
				L	P	TU	Total		TH	TS1	TS2	PR	OR	TW	**TOTAL**
EC19301	Applied Electronics	C		4	2	0	6	6	60	20	20	50	0	25	175
EC19302	Linear Integrated Circuits and Applications	C		3	4	0	7	7	60	20	20	50*	0	25	175
EC19303	Power Electronics	C		4	4	0	8	8	60	20	20	50*	0	25	175
EC19304	Project & Seminar	C		0	4	0	4	4	0	0	0	0	50*	50	100
EC19306	In plant Training	C		0	40	0	40	20	0	0	0	0	100*	100	200
	Total	**5**	**0**	**11**	**54**	**0**	**65**	**45**	**180**	**60**	**60**	**150**	**150**	**225**	**825**

Title of level 4: Diversified Courses

Course Code	Course Title	C	O	Teaching Scheme				Credit	Examination Scheme						
				L	P	TU	Total		TH	TS1	TS2	PR	OR	TW	**TOTAL**
EC19401	Microcontroller	C		3	2	0	5	5	60@	20@	20@	25	0	25	150
EC19402	Linux(MOOC)#	C		0	4	0	4	4	0	0	0	0	0	0	0
EC19403	Control System	C		4	2	0	6	6	60	20	20	0	50	50	200
EC19404	Computer Network	C		3	2	0	5	5	0	0	0	0	50	50	100
EC19407	Python 3.4.3 (MOOC)#	C		0	4	0	4	4	0	0	0	0	0	0	0
EC19408	Consumer Electronics	C		3	4	0	7	7	60@	20@	20@	0	50	50	200
EC19409	Advanced Communication	C		4	2	0	6	6	60	20	20	0	50*	50	200
EC19411	Automation	C		3	4	0	7	7	60	20	20	50	0	50	200
EC19413	MOOC(IOT, Latex, Ardium)#	C		0	4	0	4	4	0	0	0	0	0	0	0
HU19102	Environmental Studies.	C		0	2	0	2	2	0	0	0	0	25	25	50
	Total-1	10	0	20	30	0	50	50	300	100	100	75	200	325	1100
Optional-I															
EC19405	FOC		O	4	2	0	6	6	60	20	20	50*	0	25	175
EC19406	Mobile Communication		O	4	2	0	6	6	60	20	20	50*	0	25	175
Optional-II															
EC19410	VLSI		O	3	4	0	7	7	0	0	0	0	50*	50	100
EC19412	Intro to AI		O	3	4	0	7	7	0	0	0	0	50*	50	100
	Total-2	0	2	7	6	0	13	13	60	20	20	50	50	75	275
	Total 1 + Total 2	**10**	**2**	**27**	**36**	**0**	**63**	**63**	**360**	**120**	**120**	**125**	**250**	**400**	**1375**

Title of level 5: Management Courses

Course Code	Course Title	C	O	Teaching Scheme				Credit	Examination Scheme						
				L	P	TU	Total		TH	TS1	TS2	PR	OR	TW	**TOTAL**
MG19501	EDP and Management	C		3	0	0	3	3	60@	20@	20@	0	0	0	100
	Total	**1**	**0**	**3**	**0**	**0**	**3**	**3**	**60**	**20**	**20**	**0**	**0**	**0**	**100**

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from Academic Year 2019-20

Programme: Electronics Engineering (Sandwich Pattern)

Semester	Teaching scheme						Examination Scheme						
							Theory			PR	OR	TW	TOTAL
	L	P	TU	SCA	TOTAL	CREDITS	TH	TS1	TS2				
First	16	14	0	5	35	**30**	240	80	80	50	100	150	700
Second	16	14	0	5	35	**30**	300	100	100	75	25	100	700
Third	14	16	0	5	35	**30**	240	80	80	125	50	125	700
Fourth	19	14	2	0	35	**35**	240	80	80	100	100	200	800
Fifth	13	22	0	0	35	**35**	180	60	60	50	200	250	800
Sixth	0	40	0	0	40	**20**	0	0	0	0	100	100	200
Total	**78**	**120**	**2**	**15**	**215**	**180**	**1200**	**400**	**400**	**400**	**575**	**925**	**3900**
	78	**122**					**2000**			**1900**			**3900**
%	**39**	**61**				**%**	**51.28205128**			**48.71794872**			

Electronics Engineering (Sandwich Pattern) - P-19 Scheme

Path Chart - P19

Semester-I							
Sr. No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	HU19101	Communication Skills	2	2	**0**	4	4
2	EC19201	Electronics Components and Workshop	3	4	**0**	7	7
3	SC19109	Basic Mathematics	4	--	0	4	4
4	SC19104	Physics	3	2	0	5	5
5	EE19210	Fundamentals of Electrical Engineering	4	2	0	6	6
6	EC19202	Libre office Impress on BOSS Linux	--	04 #	0	4	4
			16	**14**	**0**	**30**	**30**
	Student Centered activity					**5**	
	Total Contact Hours					**35**	

Semester-II							
Sr. No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	EC19203	Basic Electronics	3	4	**0**	7	7
2	EC19204	Circuit and Network	3	2	**0**	5	5
3	EC19205	Electronic Instrument and Measurement	3	2	0	5	5
4	EC19206	Digital Electronics	3	2	0	5	5
5	SC19110	Engineering Mathematics	4	0	0	4	4
6	EC19211	C and Cpp- MOOC	0	4#	0	4	4
			16	**14**	**0**	**30**	**30**
	Student Centered activity					**5**	
	Total Contact Hours					**35**	

Semester-III							
Sr.No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	EC19301	Applied Electronics	4	2	0	6	6
2	EC19208	Introduction to Communication	4	2	0	6	6
3	EC19401	Microcontroller @	3	2	0	5	5
4	EC19302	Linear Integrated Circuits and Applications.	3	4	0	7	7
5	HU19102	Environmental Studies.	0	2	0	2	2
6	EC19402	Linux (MOOC) #	0	4#	0	4#	4
		Total	14	16	0	30	30
	Student Centered Activity(SCA)					**5**	
	Total Contact Hours					**35**	

Semester-IV							
Sr.No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	EC19403	Control System	4	2	0	6	6
2	EC19303	Power Electronics	4	4	0	8	8
3	MG19501	EDP And Management	3	0	0	3	3
4	SC19112	Applied Mathematics	1	0	2	3	3
5	EC19404	Computer Network	3	2	0	5	5
6	EC19405	Elective1 Fiber optic Communication	4	2	0	6	6
	EC19406	Elective 1 Mobile Communication					
7	EC19407	PYTHON 3.4.3 (MOOC)#	**0**	4#	0	4#	4
		Total	**19**	**14**	**2**	**35**	**35**
	Total Contact Hours					**35**	

Semester-V							
Sr.No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	EC19304	Project and Seminar.	0	4	0	4	4
2	EC19408	Consumer Electronics.	3	4	0	7	7
3	EC19409	Advanced Communication.	4	2	0	6	6
4	EC19411	Automation	3	4	0	7	7
5	EC19410	Elective 2 VLSI	3	4	0	7	7
	EC19412	Elective 2 Introduction to AI					
6	EC19413	MOOC (IOT, Latex, Arduino)#	**0**	4#	0	4#	4
		Total	13	22	0	35	35
	Total Contact Hours					**35**	

Semester-VI							
Sr.No.	Course Code	Course Title	Teaching Hours/Contact Hours				
			L	P	TU	Total	Credits
1	EC19306	In plant Training	0	40	0	40	20
	Total		0	40	0	40	20

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme:Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - I**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
HU19101	Communication Skills	02	02	--	04	04	60	20	20	25 *	--	25	150
EC19201	Electronics Components and Workshop	03	04	--	07	07	--	--	--	--	50	50	100
SC19109	Basic Mathematics	04	--	--	04	04	60	20	20	--	--	--	100
SC19104	Physics	03	02	--	05	05	60	20	20	25*	--	25	150
EE19210	Fundamentals of Electrical Engineering	04	02	--	06	06	60	20	20	--	50	50	200
EC19202	Libre office Impress on BOSS Linux#	--	04 #	--	04#	04	--	--	--	--	--	--	--
		16	**14**	**--**	**30**	**30**	**240**	**80**	**80**	**50**	**100**	**150**	**700**
Student Centered activity					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
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Department of Electronics

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme (P19) With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - II**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19203	Basic Electronics.	3	4	--	7	7	60	20	20	25	--	25	150
EC19204	Circuit and Networks.	3	2	--	5	5	60	20	20	25	--	25	150
EC19205	Electronic Instrument and Measurements	3	2	--	5	5	60@	20@	20@	--	25	25	150
EC19206	Digital Electronics.	3	2	--	5	5	60	20	20	25*	--	25	150
SC19110	Engineering Mathematics.	4	0	--	4	4	60	20	20	--	--	--	100
EC19211	C and Cpp (MOOC)#	--	4#		4#	4	--	--	--	--	--	--	--
	Total	**16**	**14**	**-**	**30**	**30**	**300**	**100**	**100**	**75**	**25**	**100**	**700**
Student Centered Activity (SCA)					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)***** Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme : Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - III**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19301	Applied Electronics.	4	2	0	6	6	60	20	20	50	0	25	175
EC19208	Introduction to Communication	4	2	0	6	6	60	20	20	0	25*	25	150
EC19401	Microcontroller	3	2	0	5	5	60@	20@	20@	25	0	25	150
EC19302	Linear Integrated Circuits and Applications.	3	4	0	7	7	60	20	20	50*	0	25	175
HU19102	Environmental Studies.	0	2	0	2	2	0	0	0	0	25	25	50
EC19402	Linux (MOOC) #	0	4#	0	4#	4	0	0	0	0	0	0	0
	Total	**14**	**16**	**0**	**30**	**30**	**240**	**80**	**80**	**125**	**50**	**125**	**700**
Student Centered Activity(SCA)					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

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Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - IV**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19403	Control Systems	4	2	0	6	6	60	20	20	0	50	50	200
EC19303	Power Electronics	4	4	0	8	8	60	20	20	50*	0	25	175
MG19501	EDP And Management	3	0	0	3	3	60@	20@	20@	0	0	0	100
SC19112	Applied Mathematics	1	0	2	3	3	0	0	0	0	0	50	50
EC19404	Computer Network	3	2	0	5	5	0	0	0	0	50	50	100
EC19405	Elective1 Fiber optic Communication	4	2	0	6	6	60	20	20	50*	0	25	175
EC19406	Elective 1 Mobile Communication												
EC19407	PYTHON 3.4.3 (MOOC)#	**0**	4#	0	4#	4	0	0	0	0	0	0	0
	Total	**19**	**14**	**2**	**35**	**35**	**240**	**80**	**80**	**100**	**100**	**200**	**800**
Total Contact Hours					**35**								

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***** Indicates assessment by External Examiner else internal practical skill test ,# indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

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Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - V**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19304	Project and Seminar.	0	4	0	4	4	0	0	0	0	50*	50	100
EC19408	Consumer Electronics.	3	4	0	7	7	60@	20@	20@	0	50	50	200
EC19409	Advanced Communication.	4	2	0	6	6	60	20	20	0	50*	50	200
EC19411	Automation	3	4	0	7	7	60	20	20	50	0	50	200
EC19410	Elective 2 (VLSI)	3	4	0	7	7	0	0	0	0	50*	50	100
EC19412	Elective 2 Introduction to AI												
EC19413	MOOC (IOT, Latex, Arduino) #	**0**	4#	0	4#	4	0	0	0	0	0	0	0
	Total	**13**	**22**	**0**	**35**	**35**	**180**	**60**	**60**	**50**	**200**	**250**	**800**
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

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Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - VI**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19306	In plant Training	0	40		40	20	0	0	0	0	100 *	100	200
	Total	0	40		40	20	0	0	0	0	100	100	200

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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Principal

P-19 Scheme

Semester	Credits	Marks
First	30	700
Second	30	700
Third	30	700
Fourth	35	800
Fifth	35	800
Sixth (In plant Training)	20	200
Total	**180**	**3900**

In 1st, 2nd and 3rd semester following "Student Centered Activity" (SCA) should be conducted for the students.

1. SCA_1 : Library hours, 1 Hour per week.
2. SCA_2 : Physical Activity (Indoor sports) 2 Hours per week.
3. SCA_3 : Creative arts 2 Hour per week.

Award of Diploma

For the award of diploma in all programmes, all courses of 5th semester and Inplant training will be considered along with weightage of third and fourth semester courses as shown in following table

All courses of 5th Semester	800
In plant Training	200
Consolidated marks of 3rd and to 4th semester*	200
Total	**1200**

*Consolidated Marks of third and fourth semester – the total marks of third and fourth semesters are converted to 100 marks each. These marks are then added (3rd Sem + 4th sem) as 100+100 = 200 marks

Class of Award Courses

Sr.No.	Semester	Course Code	Course Name	Credits	Marks
1	5	EC19304	Project and Seminar.	4	100
2		EC19408	Consumer Electronics.	7	200
3		EC19409	Advanced Communication.	6	200
4		EC19411	Automation	7	200
5		EC19410	Elective 2 (VLSI)	7	100
6		EC19412	Elective 2 Introduction to AI		
7		EC19413	MOOC (IOT, Latex, Arduino) #	4	0
8	6	EC19306	In plant Training	20	200
Total				**55**	**1000**

Backlog courses for Direct Second Year admitted Students

Sr. No	Course Code	Course Title	Proposed Backlog Courses	Status of Direct second year admitted Student
01	SC19109	Basic Mathematics	To be completed by registering the course with First year regular students in First semester (Odd Term)	ITI/ XII with no Mathematics subject
02	EC19211	C and Cpp-MOOC	Students are required to complete the course through Spoken Tutorials	XII- Science/ XII-Electronics/ passed Students whose marks in Mathematics are more than 40%.
03	EC19203	Basic Electronics	To be completed by registering the course with First year regular students in First semester (Odd Term)	All Direct second year students who have not taken any course in Electronics as optional

All Direct 2nd Year admitted Students should be promoted to 3rd year along with backlog courses.

Government Polytechnic Mumbai
Electronics Engineering Department
(Equivalence of P16 Scheme to P19 Scheme)

First year - First Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
HU16101	Basics of Communication	HU19101	Communication Skills	First
SC16104	Engineering Physics	SC19104	Physics	First
SC16107	Mathematics I	SC19109	Basic Mathematics	First
EE16201	Fundamentals of Electrical Engg	EE19210	Fundamentals of Electrical Engineering	First
ME16201	Engineering Drawing I	ME19201	Engineering Drawing I	First
HU16103	Generic Skill	No equivalence. Should be completed across the table.		
EC16205	Electronic Workshop	EC19201	Electronics Components and Workshop	First

First year - Second Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
HU16102	Communication Skills	No equivalence. Should be completed across the table.		
SC16106	Chemistry of Engineering Materials	Libre office Impress on BOSS Linux - MOOC (As per discussion with principal madam and decision taken in PBOS meeting)		
SC16108	Mathematics II	SC19110	Engineering Mathematics	Second
EC16203	Electronic Material and Components	EC19201	Electronics Components and Workshop	First
EC16201	Basic Electronics	EC19203	Basic Electronics	Second
WS16201	Workshop Practice	No equivalence. Should be completed across the table.		
HU16104	Environmental Studies	HU19102	Environmental Studies	Third

Second year - Third Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
EC16208	Digital Electronics	EC19206	Digital Electronics	Second
EC16206	Introduction to Communication	No equivalence. Should be completed across the table.		
EC16207	Introduction to Networking	EC19404	Computer Network	Fourth
EC16301	Applied Electronics and Transducer	No equivalence. Should be completed across the table.		
EC16302	Linear Integrated Circuits and Applications	EC19302	Linear Integrated Circuits and Applications.	Third
CO16202	C-Programming	EC19211	C and Cpp- MOOC	Second

Second year - Fourth Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
EC16402	Microcontroller	EC19401	Microcontroller @	Third
EC16403	Embedded System	No equivalence. Should be completed across the table.		
EC16404	Digital Signal Processing	No equivalence. Should be completed across the table.		
EC16303	Communication Network Protocol	CO19305	Computer Networks	Third
EC16304	Power Electronics	EC19303	Power Electronics	Fourth
EC16305	Professional Practices	No equivalence. Should be completed across the table.		

Third year - Fifth Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
EC16405	Red Hat Linux	No equivalence. Should be completed across the table.		
EC16406	Advanced microcontroller	No equivalence. Should be completed across the table.		
EC16407	Network Security	No equivalence. Should be completed across the table.		
EC16408	Fiber Optics Communication	EC19405	Elective1 Fiber optic Communication	Fourth
MG16501	Industrial Organization and Management	MG19501	EDP And Management	Fourth
EC16307	Industrial Training 1	No equivalence. Should be completed across the table.		
EC16409 - Optional-1	Embedded Operating System	No equivalence. Should be completed across the table.		
EC16410 - Optional-1	Network Planning and Management	No equivalence. Should be completed across the table.		
EC16417	VLSI	EC19410	Elective 2 VLSI	Fifth

Third year - Sixth Semester				
P-16 Scheme		**P-19 Scheme**		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
EC16411	Mobile Communication	EC19406	Elective 1 Mobile Communication	Fourth
EC16412	Consumer Electronics	EC19408	Consumer Electronics.	Fifth
EC16413	Advanced Communication System	EC19409	Advanced Communication.	Fifth
EC16414	Control System	EC19403	Control System	Fourth
EC16309	Industrial Training -2	No equivalence. Should be completed across the table.		
EC16415- Optional-2	Robotics	No equivalence. Should be completed across the table.		
EC16416- Optional-2	PLC and SCADA	EC19411	Automation	Fifth

P-16 Scheme		P-19 Scheme		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
EC16306-5th Sem	Project and Seminar Stage I	EC19304	Project and Seminar	Fifth
EC16308-6th Sem	Project Stage II			
EC19304 = EC16306 and EC16308				

Government Polytechnic Mumbai
Electronics Engineering Department
(Equivalence of P11 Scheme to P16 Scheme)

Third year - Fifth Semester				
P-11 Scheme		P-16 Scheme		
Course Code	**Course Name**	**Course Code**	**Course Name**	**Semester**
MG11517	Enterprenuership Development	MG16502	Enterprenuership Development	IS dept : 6th Sem

Policy for Course Detention P19

If the theory attendance of the student in any course in a semester is less than 75% and practical attendance is less than 100% (student has not completed all the prescribed practicals and not submitted the Term Work), he/she will be detained in that course at the end of the semester. Such student will not be allowed to appear for end semester examination of that course. Such students need to do course registration of that course again as per detention rules given below. Student has to satisfy the attendance and Term work criterion. After that he/she will be allowed for examination of that course. Rules of detention are as follows

- If a student is detained in any course of first year, he/she will not be eligible for second year admission, till he/she will not clear his/her detention.
- If a student is detained in any course of second year, he/she will not be eligible for third year admission, till he/she will not clear his/her detention.
- However, if a student is detained in any course of Odd semester, he/she can register for detained courses (maximum 2) in even semester, by paying additional fees as per rules.
- If a student is detained in any course of Even semester, he/she can register for detained courses (maximum 2) in vacation semester, for which he/she needs to pay additional fees as per rules of vacation semester.
- Student will not be eligible for registration of Inplant training unless, he/she completes minimum 100 credits.
- MOOC courses are exempted from above rules.
- Detention rule is not applicable for First Year Backlog courses of Direct Second Year admitted students.

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(First Semester)

GOVERNMENT POLYTECHNIC MUMBAI

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GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from Academic Year 2019-20

Programme: Electronics Engineering (Sandwich Pattern)

Semester	Teaching scheme						Examination Scheme						
							Theory			PR	OR	TW	TOTAL
	L	P	TU	SCA	TOTAL	CREDITS	TH	TS1	TS2				
First	16	14	0	5	35	**30**	240	80	80	50	100	150	700
Second	16	14	0	5	35	**30**	300	100	100	75	25	100	700
Third	14	16	0	5	35	**30**	240	80	80	125	50	125	700
Fourth	19	14	2	0	35	**35**	240	80	80	100	100	200	800
Fifth	13	22	0	0	35	**35**	180	60	60	50	200	250	800
Sixth	0	40	0	0	40	**20**	0	0	0	0	100	100	200
Total	**78**	**120**	**2**	**15**	**215**	**180**	**1200**	**400**	**400**	**400**	**575**	**925**	**3900**
	78	**122**					**2000**			**1900**			**3900**
%	**39**	**61**				**%**	**51.28205128**			**48.71794872**			

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Institutite, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme:Diploma in Electronics Engineering (Sandwich Pattern)Term / Semester - I

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
HU19101	Communication Skills	02	02	--	04	04	60	20	20	25 *	--	25	150
EC19201	Electronics Components and Workshop	03	04	--	07	07	--	--	--	--	50	50	100
SC19109	Basic Mathematics	04	--	--	04	04	60	20	20	--	--	--	100
SC19104	Physics	03	02	--	05	05	60	20	20	25*	--	25	150
EE19210	Fundamentals of Electrical Engineering	04	02	--	06	06	60	20	20	--	50	50	200
EC19202	Libre office Impress on BOSS Linux	--	04 #	--	04	04	--	--	--	--	--	--	--
		16	**14**	**--**	**30**	**30**	**240**	**80**	**80**	**50**	**100**	**150**	**700**
Student Centered activity					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

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Programme : **Diploma in CE/ME/IT/CO/IS/EE/EC/LG/LT (Sandwich Pattern)**										
Course Code: **HU19101**				Course Title**: Communication Skills**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs. 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
02	**02**	**-**	**04**	**60**	**20**	**20**	**25***	-	**25**	**150**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale: Communication skills play a vital and decisive role in career development. In this age of globalization, competition is tough. Hence effective communication skills are important. The subject Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

In this context, it will help the engineering diploma students to select and apply the appropriate methods of communication in various situations and business communication. Students are also required basics of communication and use of different skills.

This course will guide and direct to develop a good personality and improve communication skills. It will enable the students to utilize the skills necessary to be a competent communicator.

Course Outcomes: Student should be able to

CO1	Apply proper communication technique to cope up with the challenges of the modern world.
CO2	Interpret feedback at various situations by using appropriate body language and avoid the barriers in effective communication.
CO3	Able to participate in Group Discussion and Acquire the practical knowledge of an interview.
CO4	Able to develop PowerPoint Presentation and Business correspondence.
CO5	Write letters, circulars, memos, notices, reports and communicate effectively in written communication.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Communication** 1.1 Elements of Communication 1.2 Communication Cycle 1.3 Types of communication 1.4 Definition and Types of Barriers- a)Mechanical b)Physical c)Language d)Psychological 1.5 How to overcome Barriers **Course Outcome: CO1 Teaching Hours :6 hrs Marks: 14 (R- 2, U-4, A-8)**
2	**Non- verbal Communication** 2.1 Meaning and Importance of Non-verbal Communication 2.2 Body Language 2.3 Aspects of Body Language 2.4 Graphic language **Course Outcome: CO2 Teaching Hours :6 hrs Marks: 12 (R- 4, U-4, A-4)**
3	**Group Discussion And Interview Skills** 3.1 Need and Importance of Group Discussion 3.2 Use of Knowledge and Logical sequence. 3.3 Types of Interview 3.4 Preparing for an Interview **Course Outcome: CO3 Teaching Hours :6 hrs Marks: 10 (R-2, U-4, A-4)**
4	**Presentation Skills** 4.1 Presentation Skills - Tips for effective presentation 4.2 Guidelines for developing PowerPoint presentation **Course Outcome: CO4 Teaching Hours :4 hrs Marks: 08 (R- 2, U-2, A-4)**
5	**Business Correspondence** 5.1 Office Drafting – a) Notice b) Circular c) Memo d) Email-writing. 5.2 Job Application with resume. 5.3 Business Letters – a) Enquiry b)Order c)Complaint 5.4 Report Writing – a) Fall in Production b) Accident Report **Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 16 (R- 4, U-4, A-8)**

List of experiments: Any 10 experiments out of 15

Sr. No.	Unit No	COs	List of Experiments	Hours
1	1	CO1,CO4	Conversation between students on various situations.	02
2	3	CO2,CO4	Non- Verbal Communication.	02
3	3	CO3,CO4	Group Discussion	02
4	4	CO3,CO4	Mock Interview	02
5	5	CO4,CO5	Business Communication a) Advertisement, Tender, Diary writing. b) Job Application With Resume.	02
6	1	CO1	Communication Barriers	02
7	5	CO5	Business Letters – a) Enquiry b)Order c)Complaint	02
8	4	CO1,CO4	Speeches- a)Welcome Speech b)Farewell Speech c) Vote of Thanks	02
9	5	CO5	Report Writing – a) Fall in Production b) Accident Report	02
10	All	CO4	Showing Videos on different types of Communication.	02
11		CO1	*Articles	02
12		CO1	*Preposition and Conjunction	02
13		CO1	*Direct Indirect Speech	02
14		CO1	*Change the voice	02
15		CO1	*Vocabulary Building	02
			Total	**30**

Note: Experiments No.1 to 10 are compulsory. Remaining experiments are to be performed on availability of time.* These experiments will be performed during practical hours only.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Communication Skills	Joyeeta Bhattacharya - Reliable Series	9780000176981, 0000176982
2	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	13: 978-0199488803
3	Successful presentation Skills	Andrew Brad bury- The Sunday Times	13: 9780749456627

E-References:

1) Website: www.mindtools.com/page8.html-99k
2) Website:www.inc.com/guides/growth/23032.html-4
3) Website: www.khake.com/page66htm/-72k
4) Website: www.BM Consultant India Consultant India.Com
5) https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-English
6) MYCBSEGUIDE
7) Website: www.letstak.co.in
8) https://learnenglishteens.britishcouncil.org/

CO Vs PO and CO Vs PSO Mapping (Civil Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2	1	2	
CO5	3	3	2	1	2	3	2	1	2	

CO Vs PO and CO Vs PSO Mapping (Mechanical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	2	1
CO2	3	3	2	3	2	3	2	2	1
CO3	3	2	2	1	2	3	2	2	1
CO4	3	3	2	1	2	3	2	2	1
CO5	3	3	2	1	2	3	2	2	1

CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	1	1
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	3
CO2	3	3	2	3	2	3	2	2		3
CO3	3	2	2	1	2	3	2	2		3
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2			

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	1	2
CO2	3	3	2	3	2	3	2	1	2
CO3	3	2	2	1	2	3	2	1	2
CO4	3	3	2	1	2	3	2		2
CO5	3	3	2	1	2	3	2		

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2		2	
CO5	3	3	2	1	2	3	2		2	

COVs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	1	1
CO2	3	3	2	3	2	3	2	2	1	1
CO3	3	2	2	1	2	3	2	1		2
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

CO Vs PO and CO Vs PSO Mapping (LG/LT Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1		2
CO2	3	3	2	3	2	3	2	1		2
CO3	3	2	2	1	2	3	2	1	1	2
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2	1		2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement ltd. Mumbai Head Office
2	Ms Shilpa D. Khune	Corporate Consultant Trainer	Mahindra Pride Classroom
3	Mrs.S.S. Kulkarni	Lecturer in English	Government Polytechnic Pune
4	Mrs. K.S.Pawar	Lecturer in English	Government polytechnic Mumbai
5	Ms.N.N.Dhake	Lecturer in English	Government polytechnic Mumbai

Coordinator,

Curriculum Development,
Department of Science And Humanities

Head of Department

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19201**				Course Title: **Electronic Components and Workshop**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30Min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	**04**	**-**	**07**	**-**	**-**	**-**	**-**	**50**	**50**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

The main objective of this course is to impart knowledge of electronics various components used in electronics industries. This course gives proper knowledge about electronic components from point of view of their operation, testing, characteristics and specifications. Hence the students are able to select different types of electronic components according to their application.

This course is designed for developing fundamentals and motor skills in the electronics field such as testing and handling of tools, components, equipment's, cables, connectors, soldering and de-soldering technique, PCB making etc. Also this course is helpful for students to develop basic skills of assembling, testing, and troubleshooting of PCB in their electronic projects.

Course Outcomes: Student should be able to

CO1	Identify and test the different components (Resistors, capacitors, Inductors etc)
CO2	Differentiate between faulty and working components.
CO3	Identify and handling tools, testing equipments.
CO4	Selection of appropriate component, tool, testing equipment according to application.
CO5	Making and testing the PCB.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Resistors** 1.1 **Classification** of component on the basis of energy band theory: (a) Insulator (b) Conductor (c) Semiconductor. 1.2 **Properties** of (a) High resistive materials: Rubber, Sulfur. Carbon, Carbon alloy, metal, metal alloy. (b) High conductive materials: Copper, Gold. **1.3 Introduction of Components:** Discrete and non-discrete (b) Active and Passive (c) Parasitic components. (Definition) 1.4 **Concept of resistor:** Definition, material used, color code method using three four and five bands. (Simple numerical)

	1.5 **Classification of resistor:** **[A] Fixed resistor:** Linear Resistor: (a)Carbon film resistor (b)Metal film resistor (c) Wire-wound resistor (d) Carbon composition resistor. (construction, application) Nonlinear resistor:(a) Thermistor (b) Varistor (c) LDR. (working principle, construction, application) **[B] Variable resistor:** (a) Wire wound potentiometer (b) Preset (c) Trimmer / Padder. (construction, application) 1.6 **General specification:** Maximum voltage rating, power rating, temperature coefficient, tolerance, ohmic range, operating temperature. 1.7 Definition, advantages and disadvantages of SMD resistor. **Course Outcome: CO1, CO4 Teaching Hours : 09 Marks: R- NA, U-NA, A-NA**
2	**Capacitors** 2.1 **Introduction:** Definition, symbol, dielectric materials used in capacitor. 2.2 **Capacitors specification and definition:** Working voltage, Insulation resistance, c/v ratio, Power Factor, Capacitance reactance, frequency characteristics, E.S.R. 2.3 **Properties of Dielectric Material:** (a) Paper (b) Ceramic (c) Glass (d) Plastic (e) Mica. **2.4 Classification of capacitor:** (A) **Fixed capacitors:** Electrolytic capacitor: (a) Aluminum (b) Wet typetantalum. Non-electrolytic capacitor: (a)Impregnated paper capacitor (b) Ceramic capacitor (c) Glass capacitor (d)Plastic film capacitor (B) **Variable capacitor:** (a) Air-gang capacitor (b) PVC gang capacitor(c) Ceramic Trimmer / Padder. (construction, working, application) 2.5 **Coding of capacitors:** Using numerals, Color band system. **Course Outcome: CO1, CO4 Teaching Hours : 07 Marks: R- NA, U-NA, A-NA**
3	**Inductors** 3.1 **Inductors:** Definition, concept of self and mutual inductance, co-efficient of coupling, inductive reactance and Q factor. **3.2 Classification of Inductor:** **[A] Fixed inductor:** (a) Air core inductor (b) Iron core inductor (c) Ferrite core inductor. (Symbol and application) **[B] Variable inductors:** (a) Slug tuned (b) Tapped inductor. (Construction, working and application) **Course Outcome: CO1, CO4 Teaching Hours : 05 Marks: R- NA, U-NA, A-NA**
4	**Switches and Relays** 4.1 **Switches**: General specifications: voltage rating, contact current rating, contact resistance, operating time, release time, electrical life, mechanical life. 4.2 **Types of switches:** (a) Rotary (b) Push to ON (c) Push to OFF (d) Keyboard (e) Slide (f)Toggle switch.(construction and application) 4.3 **Relays**: Definition, NO/NC contacts. 4.4 **Types of relays:** (a) General purpose relay (b) Dry reed relay (c)Mercury wetted reed relay.(construction, working principle and applications) 4.5 **Comparison** between switches and relays. **Course Outcome: CO1, CO3, CO4 Teaching Hours : 08 Marks: R- NA, U-NA, A-NA**
5	**Cables and Connectors** 5.1 **Cables:** Concept of characteristics impedance, current carrying capacity. 5.2 **Types of cables**: (a) Coaxial cable (b) Twisted pair cable (c) Twin core (d) Optical

	fiber cable (e) Communication cable. (Construction, specifications and applications) 5.3 **Connectors:** General specifications: contact resistance, breakdown voltageand insulation resistance. 5.4 **Types of connectors:** (a) BNC (b) TNC (c) D type (d) Audio (e) Video (f) RJ 45.(construction, specifications and applications.) **Course Outcome: CO1, CO3, CO4 Teaching Hours : 08 Marks: R- NA,U-NA, A-NA**
6	**Printed Circuit Board** 6.1 **Introduction to PCB** ,Advantages & disadvantages of PCB, Types of PCB 6.2 Base & Conducting material, types of laminates, Flowchart for preparation of PCB. 6.3 Screen printing ,photo printing method 6.4 Drilling, Mounting of components 6.5 **Soldering technique:** Methods of soldering, Dip, wave, Hand, Necessary conditions for soldering 6.6 Final protection, Safety, health & Medical aspects of Soldering **Course Outcome: CO5 Teaching Hours : 08 Marks: R- NA, U-NA, A-NA**

List of experiments: Any 12 experiments out of 15 (1 to 8 experiments are compulsory)

Sr. No.	Unit No	CO	List of Experiments	Hours
1.	**1**	CO1 CO2	• To identify and test the resistor (fixed, variable). • Find out resistance and tolerance by color code method and multimeter.	04
2.	**2**	CO1 CO2	• To identify and test the capacitor (Electrolytic, Ceramic, Paper, Mica etc) • Value by colour code, numerical, character or printed value method.	04
3.	**-**	CO3	Identify and handle the controls of analog and digital multimeter.	04
4.	**-**	CO3 CO4	Function Generator and CRO Handling: To identify the Square wave, Triangular wave and Sine wave generated by Function Generator and measure their Amplitude and Frequency on CRO.	04
5.	**5**	CO1 CO2 CO4	• To demonstrate and check the functioning of connectors (BNC, TNC, RJ 45). • Connection of any one of the above connectors with appropriate cable.	04
6.	**6**	CO5	Introduction of Circuits Drawing Software: • Identify the features of Electronic Circuit drawing software like Express SCH , EAGLE PCB. • Draw circuit diagram of simple circuits. (Ex. Dual regulated power supply and single stage BJT amplifier etc)	04

7.	6	CO3 CO5	Making of PCB: • To identify, testing and handling of PCB, Types of PCB. • Draw layout on PCB base, use of paint/Templates/Pen etc for tracks. • Etching materials, Drill bits used for Drilling.(Fabricate the PCB by pattern transfer, etching, cleaning and drilling) • Mounting and Soldering of components on Drilled PCB as per circuit diagram. • Cleaning of PCB. • Testing and troubleshooting of mounted circuits on PCB. Verifying circuit output.	10
8.	6	CO1 CO4 CO5	**Mini Project:** To prepare PCB (with layout, artwork designed by the student) for small electronic circuits. Note: Mini project group may consist of 3-4 students. Student has to demonstrate the project and submit the project report in synopsis form.	10
9.	3	CO1 CO2	• To identify and test the inductors. • Find the value and tolerance of inductor by color code method	04
10.	`1	CO1 CO2	• To identify and test the performance of LDR. • Calculate the value resistance for different intensity of light.	04
11.	4	CO1 CO2	• To identify and test the various switches (Rotary, Push to ON, Push to OFF, Toggle switch). • Determine the value of contact resistance of switches.	04
12.	4	CO1 CO2	• To trace the parts of relay coil and NO/NC contacts. • Determine the contact resistance of general purpose relay	04
13.	5	CO1 CO2	To demonstrate and check continuity of cables using meter (Twisted pair, Coaxial, Flat ribbon).	04
14.	6	CO3	• Demonstration of electronics tool used in lab. • Handling and Identification of tools. • Applications of electronics tool.(Nose pliers ,wire stripper, screwdrivers, align keys, align screw, cutter, hand Hacksaw & crimping tools (for RJ-45, RJ-11)) .	04
15.	6	CO1 CO4	Tracing internal parts of the power supply: Opening the power supply & identify the transformer, rectifier section, heat sink, power transistor, earth terminal, fuse.	04
			Total	**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronic material and component.	Mrs. Madhuri Joshi , Shroff Publication	8173669007/ 9788173669002
2	Electrical and electronic measurements and instruments.	A. K. Sawhney , Dhanpat Rai and Son's	8177000160/ 978-8177000160
3	Electronic components and materials.	S. M. Dhir, Tata McGraw Hill, Education	0-07-463082-2/ 9780074630822
4	Build your own electronic workshop	Thomos Petruzellis, Tata McGraw Hill, Education	0071447245/ 9780071447249
5	Printed Circuit Board	Walter Bosshart, Tata McGraw Hill, Education	0074515497/ 978-0074515495
6	Electronic material and component.	Patil, Deshmukh, Markande ,BPB Publication	---

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1. www.electronics-tutorials.com
2. www.electronicsandyou.com
3. www.youtube/circuitbasics.com .
4. www.circuitstoday.com
5. https://techdocs.altium.com/display/ADOH/Tutorial+-Getting+Started+with+PCB+Design assessed on 8th October 2016.
6. www.zapmeta.co.in/Mini+Project+Of+Electronic, assessed on 28thSeptember 2016
7. https://ndl.iitkgp.ac.in

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	2	3	-
CO3	1	2	-	3	-	-	-	2	2	-
CO4	2	2	2	3	-	-	-	3	2	2
CO5	-	-	2	-	2	1	3	3	3	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. D.M.Lamture	Head of electronics department.	Government Polytechnic, Kolhapur
2	Mr. Nagesh Pai	Proprietor	Sun Electronics, Borivali West, Mumbai.
3	Mrs. B. J. Nimbalkar.	Sel.Gr Lecturer in Electronics	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in CE/ME/IT/CO/EC/IS/EE(Sandwich Pattern)**										
Course Code: **SC19109**				Course Title**: BASIC MATHEMATICS**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs. 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	**-**	**-**	**04**	**60**	**20**	**20**	**-**	-	**-**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

CO1	Identify the basic principles of mathematics about the field analysis of any engineering problem.
CO2	Apply rules ,concept and properties to solve the basic problems.
CO3	Establish relation between two variables.

Course Content Details:

Unit No	Topics / Sub-topics
1	**1.Trigonometry:** 1.1 Trigonometric ratios of allied angles, compound angles, multiple. angles (2A, 3A), Sub multiple angles 1.2 Factorization and De-factorization Formulae 1.3 Inverse Circular function (definition and simple problems). **Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)**
2	**2.Vectors:** 2.1 Definition of vector , position vector 2.2 Algebra of vectors(Equality, addition ,subtraction and scalar multiplication) 2.3 Dot (Scalar) product & Vector (Cross) product with properties. **Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U-4 , A-4)**
3	**3.Logarithms:** 3.1 Definition of logarithm 3.2 Laws of logarithm 3.3 simple examples based on laws. **Course Outcome: CO2 Teaching Hours : 10hrs Marks:10 (R-4 , U- 4 , A-2)**
4	**4.Probability :** 4.1 Definition of random experiment , sample space, event, occurance of event and types of event (Impossible , mutually exclusive , exhaustive ,equally likely) 4.2 Definition of Probability 4.3 Addition & Multiplication Theorems of probability without proof , simple examples **Course Outcome: CO1 Teaching Hours :10hrs Marks:10 (R-4, U- 4 , A-2)**
5	**5.Determinants:-** 5.1 Definition of Determinant 5.2 Expansion of Determinant of order 2X3 5.3 Crammer's rule to solve simultaneous equations in 3 unknowns **Course Outcome: CO2 Teaching Hours :10 hrs Marks:10 (R- 2 , U-4 , A-4)**
6	**6.Matrices:** 6.1 Definition of a matrix of order m x n 6.2 Types of matrices 6.3 Algebra of matrices - equality, addition,subtraction ,multiplication & scalar multiplication. 6.4 Transpose of matrix. 6.5 Minor , co-factor of an element. 6.6 Adjoint & inverse of a matrix by adjoint method. 6.7 Solution of a simultaneous equations by matrix inversion method. **Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4 , A- 4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Trigonometry**	04	04	02	10
2	**Vectors**	02	04	04	10
3	**Logarithms**	04	04	02	10
4	**Probability**	04	04	02	10
5	**Determinants**	02	04	04	10
6	**Matrices**	02	04	04	10
	Total	**18**	**24**	**18**	**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students (Volume I)	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

E-References:

1. www.math-magic.com
2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	
CO2	3	2					1	1	
CO3	3			2			1	1	

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		
CO2	3	2					1	1		
CO3	3			2			1	1		

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	1
CO2	3	2					1		1	1
CO3	3			2			1		1	1

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	
CO2	3	2					1		1	
CO3	3			2			1		1	

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	1
CO2	3	2					1	1	1
CO3	3			2			1	1	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement ltd. Mumbai Head Office
2	Mrs. Deepawali S. kaware	Lecturer in Mathematics	Government polytechnic Vikaramgad
3	Mr. A.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr.V.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Head of Department

Coordinator,
Curriculum Development,
Department of Science And Humanities

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: SC19104				Course Title: **Physics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs.30 minutes)	TS1 (1Hr.)	TS2 (1 Hr.)	PR	OR	TW	Total
3	**2**	**--**	**5**	**60**	**20**	**20**	**25***	--	**25**	**150**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the Students.

Course Outcomes: Student should be able to

CO1	State the different physical quantities, identify the proper unit of it and to estimate error in the measurement of physical quantities
CO2	Apply laws of motion in various engineering applications
CO3	Apply the concept of electric field in Engineering field.
CO4	Apply the concept of Sound waves , Nanotechnology, Ultrasonic waves in engineering applications
CO5	Identify the physical properties of the various materials such as, elasticity and viscosity

Course Content Details:

Unit No	Topics / Sub-topics
1	**Units and Measurements** 1.1 Fundamental Physical quantities, examples. 1.2 Derived physical quantities, examples. 1.3 Definition and requirements of unit 1.4 System of units, C. G. S., M. K. S. and S. I. units. 1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures. 1.6 Error – Definition, types of errors and estimation of errors. 1.7 Numerical **Course Outcome: CO1 Teaching Hours: 6 hrs. Marks: 8 (R- 2, U-2, A-4)**
2	**Motions** 2.1 **Linear motion** –Definition – distance, displacement, velocity, acceleration retardation, equations of motion, Numerical. 2.2 **Periodic motions** : a)Oscillatory motion, b)Vibratory motion, c) S.H.M.), d) Circular motion. (only definition and examples) some terms related to S.H.M.-- Definition: Time period, frequency, Amplitude, wavelength, phase 2.3 **Angular motion:** a)Uniform circular motion, Radius vector, linear velocity, Angular velocity , Angular acceleration, b) Relation between linear velocity and angular Velocity (derivation), Radial or centripetal acceleration, Three equations of motion (no derivations) Centripetal and Centrifugal force, examples and Applications. **Course Outcome: CO2 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U-4 , A-4)**
3	**Electrostatics** 3.1 Definition of charge 3.2 Coulombs law Definition of electric field Definition and unit of electric field intensity (E) 3.3 Definition and properties of electric lines of force 3.4 Definition of electric flux and electric flux density 3.5 Electric Potential 3.6 Definition & Explanation of Electric Potential 3.7 Definition & Explanation of absolute Electric Potential 3.8 Equation of electric potential (no derivation) 3.9 Numerical. **Course Outcome: CO3 Teaching Hours: 6 hrs. Marks: 8 (R- 2 , U- 4 , A- 2)**
4	**Sound Waves** 4.1 Wave motion, types of waves – progressive Waves: Longitudinal and transverse waves. 4.2 Characteristics of longitudinal and transverse waves And comparison between longitudinal and transverse waves. 4.3 Free or natural vibrations and forced vibrations, Resonance – definition and examples. 4.4 Determination of velocity of sound by resonance Method. 4.5 Numerical. **Course Outcome: CO4 Teaching Hours: 6 hrs. Marks: 8 (R- 2 , U- 4 , A- 2)**

5	**Nanotechnology & Ultrasonic Waves** **5.1 Nanotechnology** : 5.1.1 Introduction to nanotechnology. 5.1.2 Definition of Nano scale, manometer and nanoparticles, Nanotechnology. 5.1.3 Definition and examples of nanostructured materials. 5.1.4 Applications of nanotechnology in different fields - a) electronics, b) automobile, c) medical, d) textile, e) Cosmetics, f) environmental, g) space and defense. **5.2 Ultrasonic Waves** 5.2.1 Ultrasonic waves and infrasonic waves. 5.2.2 Audible range of sound wave 5.2.3 Properties of ultrasonic wave. 5.2.4 Applications. **Course Outcome: CO5 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U- 2 , A-6)**
6	**General Properties of Matter:** 6.1 Elasticity: 6.1.1 Deforming force, restoring force, Elastic, plastic and Rigid substances, and their examples. 6.1.2 Definition of elasticity, stress, strain and its types. 6.1.3 Hooke's Law and elastic limit. 6.1.4 Stress - Strain curve yield point, breaking point. 6.1.5 Young's Modulus, bulk modulus and modulus of Rigidity – Definition and relation among them. 6.1.6 Factor of safety. 6.1.7 Applications of elasticity. 6.1.8 Numerical **6.2 Viscosity** 6.2.1 Concept and Definition of viscosity, velocity gradient. 6.2.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity 6.2.3 Stokes law, terminal velocity, derivation of Stoke's Formula. 6.2.4 Streamline flow, turbulent flow, critical velocity. 6.2.5 Reynolds's number and its significance. 6.2.6 Applications of viscosity 6.2.7 Numerical **Course Outcome: CO5 Teaching Hours: 11 hrs. Marks: 16 (R- 4 , U- 6 , A-6)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Units and Measurements**	2	2	4	8
2	**Motion**	2	4	4	10
3	**Electrostatics**	2	4	2	8
4	**Sound waves**	2	4	2	8
5	**Nanotechnology & Ultrasonic waves**	2	2	6	10
6	**General Properties of Matter**	4	4	8	16
	Total	**14**	**20**	**26**	**60**

List of experiments:

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO 1	To know your Physics laboratory and use of scientific calculator	2
2	1	CO 1	To measure the dimensions of given objects and to determine their Volume using Vernier caliper.	2
3	2	CO 2	To determine Acceleration due to gravity by simple pendulum.	2
4	3	CO3	To verify principle of potentiometer.	2
5	4	CO 4	To determine velocity of sound by resonance method.	2
6	6	CO 5	To determine the Young's modulus of elasticity of wire using Young's apparatus.	2
7	1	CO1	To measure the dimensions of given objects and to determine their volume using micrometer screw gauge.	2
8	6	CO 5	To determine coefficient of viscosity of liquid by Stokes' method .	2
9	4	CO4	To determine sound absorption coefficient of different materials.	2
10	2	CO 2	To determine stiffness constant by using helical spring .	2
11	4	CO4	To determine velocity of sound by using sonometer.	2
12	5	CO4	To study applications of nanotechnology in engineering field.	2
13	3	CO 3	To verify coulomb's law of electrostatics.	2
14	6	CO 5	To determine coefficient of viscosity of given liquid by using poiseuille's method.	2
15	ALL	CO 1	Showing Video on different applications related to units	2
			Total	**30**

Note: Experiments No. 1 to10 are compulsory and should map all units and Cos. Remaining 5 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Applied Physics	Manikpure&Deshpande ,S.Chand& Company	10:8121919541 13:9788121919548
2	Applied Physics	B.G.Bhandarkar, Vrinda Publication	0071779795
3	Optics & Optical Fibers	Brijlal Subhramanyan	978-3-662-52764-1
4	Engineering Physics	Gaur and S.L.Gupta S.Chand& Company	0-07-058502
5	Physics	Resnick and Halliday Tata McGraw Hills	978-0-07-1755487-3
6	Physics part I & II	H.C.Varma	9788177091878
7	Properties of Matter	D.S.Mathur	13: 978-8121908153

E-References:

1. www. Physics.org
2. www.physicsclassroom.com
3. www.youtube/physics
4. www.ferrofphysics.com
5. http;//hperphysics.phastr.gsu.edu/hbase/hph.htm
6. www.sciencejoywagon.com/physicszone
7. https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-physics
8. MYCBSEGUIDE
9. **https://ndl.iitkgp.ac.in/**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	2	1	1
CO2	3							1		1
CO3	3				1			1	1	1
CO4	3			2	1			2	1	1
CO5	3		2				1	1	1	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/organization
1	Mr Rajesh Masane	Sr. Engineer	L&T Mumbai
2	Mrs Raji Nair	Lecturer in Physics	VPM Polytechnic
3	Mrs S.A. Thorat	Lecturer in Physics	Govt. Polytechnic Mumbai
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Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Departments
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EE19210**				Course Title: **Fundamentals of Electrical Engineering**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**-**	**50**	**50**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

All the equipment related to electronics utilizes electrical energy for their operations. Diploma holders from this branch come across various types of electrical circuits. The purpose of this subject is to give fundamental knowledge of electrical engineering so that they will be able to handle electrical equipment's, electrical & electronic circuits and analyze simple DC/AC circuits.

Course Outcomes: Student should be able to

EE19210.1	Define basic terminologies related to electrical circuit
EE19210.2	Solve simple DC circuits
EE19210.3	Realise Magnetism and Electromagnetism concept
EE19210.4	State concepts of ac fundamentals and solve simple ac series circuits.
EE19210.5	Primitive performance of single-phase transformer
EE19210.6	Use of electrical safety to avoid electrical hazards.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Basic Concepts:** 1.1 Electric Current: Definition, Direction of current, unit, Electric potential, Potential difference, Concept of EMF and Potential difference. 1.2 Resistance: Definition, unit, Factors on which resistance depends Effect of temperature on resistance. *(simple numerical)* 1.3 Conductance, Ohms Law. *(simple numerical)* 1.4 Electric power and energy concept and unit. *(simple numerical)* 1.5 Measurement of voltage, current, power and energy. 1.6 Effects of Electric Current: Heating Effect, Magnetic Effect and Chemical Effect.*(Only*

	Introduction) **Course Outcome: EE19210.1 Teaching Hours :10 hrs Marks: 10 (R-0 , U-2, A-8)**
2	**DC Circuits**: 2.1 Introduction to concept. 2.2 DC series circuit: Concept, Equation for equivalent resistance connected in series, Main Characteristics, Advantages, Disadvantage, Application of series circuit. 2.3 DC Parallel circuit**:** Concept, Equation for equivalent resistance connected in parallel, Main Characteristics, Advantages, Application of Parallel circuit, Current divider rule. 2.4 Series parallel circuit, Application of series parallel circuit. 2.5 Definition of: Circuit, Parameter, Liner circuit, Nonlinear circuit, Bilateral circuit, Unilateral circuit, Electric network, Passive-Network, Active network, Node, Branch, Loop, Mesh. 2.6 Kirchhoff's current law, Kirchhoff's voltage law, signs convention. *(simple numerical limited up to two variables on above)* **Course Outcome: EE19210.2 Teaching Hours :12 Marks: 10 (R- 2 , U- 0 , A- 8)**
3	**Magnetism and Electromagnetic induction:** 3.1 Definition of Magnetic field, Magnetic flux, Magnetic flux Density, Magnetic Intensity, Absolute and Relative permeability, relation between B and H. 3.2 Magnetic effect of electric current, Right hand rule, cork screw rule, Current carrying conductor in magnetic field, Fleming's left-hand rule. 3.3 Magnetic circuit, mmf, Reluctance, Permeance, comparison between Magnetic and Electric circuit. 3.4 Magnetization curve for magnetic and non-magnetic material, Magnetic Hysteresis, Hysteresis Loop, Hysteresis Loops for Hard & Soft Magnetic Materials, residual flux, Retentivity, coercive force, Hysteresis loss. 3.5 Electromagnetic induction, Faradays laws of electromagnetic Induction, Lenz's law, Flemings right hand rule, Dynamically induced EMF, Statically induced EMF, self-Inductance, mutual inductance, coefficient of coupling. (Only equations, No derivation of equations and numerical on unit 3) **Course Outcome: EE19210.3 Teaching Hours :10 Marks: 10 (R- 4 , U- 6 , A- 0)**
4	**AC Fundamentals:** 4.1 Difference between AC and DC quantity. 4.2 Advantages of AC Over DC. 4.3 Generation of A.C. Voltage and current. 4.4 Mathematical Expression of alternating quantity & its derivation. 4.5 Definition of Waveform, Instantaneous value, Cycle, Time period, Frequency, Amplitude, Peak value, Average value and RMS value, Form factor and Peak factor for sinusoidal (no derivation, simple numerical on it) 4.6 Phase, Phase difference, Phasor representation of sinusoidal quantities 4.7Circuit diagram, phasor diagram and wave form of a.c. circuits through pure Resistance, Pure Inductance and pure Capacitance. Concept of inductive reactance and capacitive reactance. 4.8 Circuit diagram, phasor diagram and wave form of a.c. circuits RL, RC and RLC circuit. Impedance and Impedance Triangle. (simple numerical) 4.9 Power- active, reactive and apparent, power triangle.

	4.10 Power factor and its significance. **Course Outcome: EE19210.4 Teaching Hours : 15 Marks: 12 (R- 0 , U- 4 , A- 8)**
5	**Single Phase Transformer:** 5.1 Construction and working of transformer, classification, brief description of each part, its function 5.2 significance of E.M.F. equation *(No derivation)* 5.3 Voltage ratio, current ratio and transformation ratio. 5.4 KVA rating of a transformer. 5.5 Losses in a transformer 5.6 Efficiency and voltage regulation (no numerical) 5.7 Auto transformer-comparison with two winding transformers and application **Course Outcome: EE19210.5 Teaching Hours :6 Marks:10 (R-2 , U- 8 , A- 0)**
6	**Electrical Safety** 6.1 Fuse: Operation, types 6.2 Switch Fuse Unit and Fuse Switch Unit: Differences 6.3 MCB, ELCB & MCCB: Operation and general specification. 6.4 Earthing: Definition, necessity of earthing, types of earthing. 6.5 Electrical Safety precautions in electrical indoor and outdoor installations. 6.6 First Aid Treatment: Precautions if person gets an electric shock. Methods of artificial respiration **Course Outcome: EE19210.6 Teaching Hours :7 Marks:8 (R-4 , U-4 , A-0)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basic Concepts	--	2	8	10
2	DC Circuits	2	--	8	10
3	Magnetism and Electromagnetic induction	4	6	--	10
4	AC Fundamentals	--	4	8	12
5	Single phase Transformer	2	8	--	10
6	Electrical Safety	4	4	--	8
	Total	**12**	**24**	**24**	**60**

List of experiments: Any 10 experiments out of 15

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	**EE19210.1**	To measure current, voltage, power and energy in single-phase circuit	02
2	2	**EE19210.2**	Measure voltages and currents in series resistive circuit.	02
3	3	**EE19210.3**	To plot the B-H curve for magnetic material and determine the relative Permeability	02
4	4	**EE19210.4**	Observe AC & DC waveform and measure AC voltage & DC voltage with oscilloscope.	02
5	5	**EE19210.5**	To verify efficiency and regulation of transformer	02
6	6	**EE19210.6**	Safety precautions to be observed for indoor and outdoor installations and know first aid practice also refer artificial respiration chart	02
7	1	**EE19210.1**	To verify the effect of temperature on resistance of copper conductor.	02
8	2	**EE19210.2**	Measure voltages and currents in parallel resistive circuit.	02
9	3	**EE19210.3**	Observe that EMF is induced in coil when magnetic lines of force move across winding and observe its polarity	02
10	4	**EE19210.4**	Determine impedance, phase angle of R-L series circuit, plot phasor diagram and also calculate active, reactive and apparent power consumed in R-L series circuit.	02
11	5	**EE19210.5**	Measure the transformation ratio of transformer	02
12	6	**EE19210.6**	Measure Earth resistance using earth tester. Observe procedure of plate earthing	02
13	2	**EE19210.2**	Verify Kirchhoff's current law	02
14	2	**EE19210.2**	Verify Kirchhoff's voltage laws	02
15	4	**EE19210.4**	Observe the phase relationship between voltage and current in pure resistive, inductive and capacitive circuit.	02
Total				**30**

Note: Experiments No. 1 to 6 are compulsory and should map all units and Cos. Remaining

4 experiments are to be perform on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electrical Technology (Volume I)	B. L. Theraja and A. K. Thereja, S. Chand and Co. Ltd.	81-219-2440-5
2	Basic Electrical Engineering	V. K. Mehta and Rohit Mehta, S. Chand and Co. Ltd.	9788121908719
3	Electrical Technology	Edward Hughes, ELBS Publications.	9780582226968

E-References:

1. www. nptel.com
2. www.electrical4u.com
3. www.khanacademy.org
4. **https://ndl.iitkgp.ac.in/**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE19210.1	3	3	--	2	2	--	3.	2	2	2
EE19210.2	3	3	--	2	2	--	3	2	2	2
EE19210.3	3	3	--	2	--	--	3	3	2	2
EE19210.4	3	--	--	2	2	--	3	3	2	2
EE19210.5	3	3	--	2		--	3	3	2	2
EE19210.6	--	--	--	3	3	--	3	2	2	--

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Kuldeep Singh Rajput	Deputy Executive Engineer	400KV RSOM, Kharghar Navi Mumbai
2	Mrs.S.P. Phadnaik	Lecturer in Electrical Engineering	G.P. Pune
3	Miss A.V. Patil	Lecturer in Electrical Engineering	G.P.Mumbai
4	Dr. P. N. Padghan	Lecturer in Electrical Engineering	G.P.Mumbai

Coordinator,
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Head of Departments
Department of Electronic Engineering

I/C, Curriculum Development Cell

Principal

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(Second Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme (P19) With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - II**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19203	Basic Electronics.	3	4	--	7	7	60	20	20	25	--	25	150
EC19204	Circuit and Networks.	3	2	--	5	5	60	20	20	25	--	25	150
EC19205	Electronic Instrument and Measurements.	3	2	--	5	5	60@	20@	20@	--	25	25	150
EC19206	Digital Electronics.	3	2	--	5	5	60	20	20	25*	--	25	150
SC19110	Engineering Mathematics.	4	0	--	4	4	60	20	20	--	--	--	100
EC19207	C and Cpp. (MOOC)	--	4#		4	4#	--	--	--	--	--	--	--
	Total	**16**	**14**	**-**	**30**	**30**	**300**	**100**	**100**	**75**	**25**	**100**	**700**
Student Centered Activity (SCA)					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)***** Indicates assessment by External Examiner else internal practical skill test , **#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

Programme: **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19203**				Course Title: **Basic Electronics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	4	-	7	60	20	20	25	-	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

It is necessary for the students of electronics and related branches to study and apply the basic principles, analyze and troubleshoot simple subsystems. To acquire this level of understanding, the basic knowledge of electronic devices and circuits is essential. This course is one of the core subjects which deals with construction, working principle, application of active components.

Course Outcomes: Student should be able to

CO1	Describe the fundamentals of diode.
CO2	State different types of diodes and their applications.
CO3	Illustrate the transistor fundamentals and its biasing techniques (BJT AND FET).
CO4	Interpret the working of regulated power supply.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Semiconductor Diode:** 1.1 Classification of component on the basis of energy band theory and effect of temperature. 1.2 Different types of semiconductor and their materials. P-type and N-type semiconductors 1.3 Symbol, construction, working principle, forward and reverse biasing, V-I Characteristics and applications of following diodes: PN junction, Zener, LED, Photo diode. **Course Outcome: CO1 and CO2 Teaching Hours:09 hrs Marks:12 (R-4, U-4, A-4)**
2	**Diode application:** 2.1 Types of rectifier: Circuit, waveform and working of Half Wave, Bridge Full Wave Rectifier and Full wave rectifier using Center tapped transformer. 2.2 Parameters of rectifier: Average DC value of current and voltage, ripple frequency, ripple factor, PIV of diode, TUF, efficiency of rectifier. 2.3 Types of Filters: Waveform and working of Shunt capacitor, series inductor and Π filter. 2.4 Diode as clipper and clamper:

	(A) Circuit diagram, waveform and working of positive, negative and biased clipper. (B) Circuit diagram, waveform and working of positive, negative and biased clamper. **Course Outcome:CO2 Teaching Hours :14 Marks:16 (R-4, U-6, A-6)**
3	**Transistor Fundamentals:** 3.1 Construction and working of PNP and NPN transistors. 3.2 Transistor configuration: CB, CE, CC. 3.3 Working and characteristics of transistors in CB, CE and CC modes. 3.4 BJT Biasing : DC load line, Operating point, stabilization, concept of thermal runaway. Types of biasing: circuit and analysis of Fixed bias, base bias with Emitter feedback, Voltage divider bias. 3.5 Transistor applications: 3.5.1 Transistor as a Switch 3.5.2 Single stage CE amplifier. (circuit diagram and working) **Course Outcome:CO3 Teaching Hours :11 Marks:16 (R-6, U-6, A-4)**
4	**Field Effect Transistor:** 4.1 Symbol, construction, working and characteristics of JFET (N-channel and P-channel) and MOSFET (Depletion and enhancement type) 4.2 FET Biasing: Source self-bias, drain to source bias. 4.3 Applications of FET **Course Outcome: CO3 Teaching Hours :7 Marks:08 (R-2, U-4, A-2)**
5	**Regulated Power supply:** 5.1 Block diagram of DC regulated power supply. 5.2 Load regulation and line regulation. 5.3 Zener diode as voltage regulator. 5.4 Transistorized series and shunt regulator- circuit diagram and working. **Course Outcome: CO4 Teaching Hours :4 Marks:08 (R-2, U-2, A-4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Semiconductor Diode	4	4	4	12
2	Diode application	4	6	6	16
3	Transistor Fundamentals	6	6	4	16
4	Field Effect Transistor	2	4	2	8
5	Regulated Power supply	2	2	4	8
	Total	**18**	**22**	**20**	**60**

List of experiments: Total 12 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To plot the V-I characteristic of semiconductor P-N diode and LED.	04
2	2	CO2	To observe the waveform of half wave rectifier and Center tapped full wave rectifier	04
3	3	CO3	To plot i/p and o/p characteristics of BJT in CE Mode	04
4	5	CO4	Calculate load and line regulation of Zener regulator	04
5	1	CO1	To plot the V-I characteristic of Photo diode and Zener diode	04
6	2	CO2	To observe the waveform of half wave rectifier with LC and π Filter	04
7	2	CO2	To observe the waveform of Center tapped full wave rectifier with LC and π filter	04
8	2	CO2	To observe the waveform of Bridge wave rectifier with LC filter and without filter.	04
9	2	CO2	To observe the waveform of Bridge wave rectifier with π filter. To observe the waveform of negative clipper circuit. Draw input and output waveform	04
10	2	CO2	To observe the waveform of clipper circuit (Positive and biased) Draw input and output waveform	04
11	2	CO2	To observe the waveform of clamper circuit (Positive, negative) Draw input and output waveform	04
12	3	CO3	To plot i/p and o/p characteristics of BJT and find out input resistance and o/p resistance of BJT in CB Mode.	04
13	4	CO3	To plot the characteristic of JFET(N-channel) and MOSFET	04
14	1,2,3, 4,5	CO1, CO2, CO3, CO3	1 Mini project: suggested by Course teacher. (testing on bread board , soldering on PCB etc)	04
15	1,2,3, 4,5	CO1, CO2, CO3, CO3	Mini project: suggested by Course teacher. (trouble shooting , report preparation etc)	04
		Total		**60**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronics Principles	Malvino, Albert Paul, David (McGraw Hill Education)	0-07-462236-6
2	Principles of Electronics	Mehta V.K., Mehta Rohit (S. Chand and Company)	978-81-219-2450-2
3	Fundamentals of Electronic Devices and Circuits	Bell, David (Oxford University Press)	0-19-569428-7
4	A text book of Applied Electronics	Sedha R.S. (S. Chand)	81-219-2783-8

E-References:

1. https://ndl.iitkgp.ac.in/
2. www. electronicshub.org/tutorials/
3. www.tutorialspoint.com/
4. www.youtube.com
5. https://phet.colorado.edu/en/simulation/legacy/semiconductor

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	2	2	1
CO2	2	2	2	-	-	-	2	3	2	2
CO3	2	2	2	1	-	-	1	3	2	2
CO4	1	2	3	1	-	-	2	2	1	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mrs. Salunke Suvarna	Sr. Controls Engineer	Vanderlande Industries Software Pvt Ltd.Pune
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Coordinator,
Curriculum Development,
Department of Electronics.

Head of Department
Department of Electronics.

I/C, Curriculum Development Cell

Principal

Programme: **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code:**EC19204**				Course Title: **Circuits and Networks**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Min)	TS1 (1Hrs)	TS2 (1Hrs)	PR	OR	TW	Total
3	2	-	5	60	20	20	25	-	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This subject is introduced to understand the basic laws and theorem used in electronics circuits and systems. Simplification and analysis of the circuit will help to strengthen the analytical abilities of students.

Course Outcomes: Student should be able to

CO1	Interpret Network laws and simple networks.
CO2	Interpret Network Conversion and Reduction
CO3	Apply theorems in solving numerical problems.
CO4	Design simple resonant and filter circuits.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Networks and Circuits** 1.1 Definition and concept of Branch, Potential source, Current source. 1.2 Impedance, resistance, inductance, capacitance. 1.3 Mesh analysis, Super mesh analysis. (Simple numerical) 1.4 Node analysis, Super node analysis. (Simple numerical) 1.5 Principle of duality. **Course Outcome: CO1 Teaching Hours :7 hrs Marks: 08 (R- 2, U-2, A-4)**
2	**Network Conversion and Reduction** 2.1 Open circuit and short circuit impedances for T and π-networks. 2.2 T to π-network conversions: T to π-impedance conversion with derivation , π to T impedance conversion with derivation. [Numerical based on resistive network only] **Course Outcome:CO2 Teaching Hours :7 hrs Marks: 04 (R- 2 , U- 0, A-2)**

3	**Network Theorems:** Statements of Theorems and their application for solving simple electricalnetworks. 3.1 Thevenin's theorem 3.2 Norton's theorem 3.3 Superposition theorem 3.4 Maximum power transfer theorem 3.5 Millman's theorem [Numerical based on above to know importance of each theorem.] **Course Outcome:CO3 Teaching Hours : 7hrs Marks: 10 (R-2, U-4 , A- 4)**
4	**Two port Networks:** 4.1 Basic relationship for 2 port networks. 4.2 Definitions: Z parameters, Y parameters, h parameters, ABCD parameters. 4.3 Imageimpedance,iterativeimpedance. [Numericalbasedonabovetoknow importance of each set ofParameters] **Course Outcome:CO3 Teaching Hours :07 Marks: 12 (R-4, U-4, A-4)**
5	**Resonant circuits and transient response** 5.1 Definition of Q factor. 5.2 Series resonance: Frequency, bandwidth, Q-factor for resonance. Voltage and current curves, magnification at resonance. 5.3 Parallel resonant circuit: Frequency, bandwidth, Q-factor for resonance. Voltage and current curves,magnification at resonance. 5.4 DC response: Theoretical derivations to discuss response ofR-C, R-L, R-L-C circuits. **Course Outcome:CO4 Teaching Hours :8 hrs Marks: 12 (R-4, U-4, A-4)**
6	**Filters and Attenuators** 6.1 Simple constant K- filters: low pass filter, high pass filter. Reactance curves, conditions at cut off, design equations. 6.2 Band pass, band stop filters:ideology, practical conditions, Design equations. 6.3 M-derived filter: Low pass filter, high pass filter only. Design equations[No derivations, only numerical based on endequations] 6.4 Attenuators: Units -Nepers, decibels. Concept of Fixed symmetrical T and π-attenuator. [Avoid in-depth mathematical treatment for all filters and attenuators.] **Course Outcome:CO4 Teaching Hours :09 hrs Marks: 14 (R-4, U-6, A-4)**

Suggested Specifications Table (Theory):

Unit No.	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Networks and Circuits	02	02	04	08
2	Network Conversion and Reduction	02	-	02	04
3	Network Theorems	02	04	04	10
4	Two port Networks	04	04	04	12
5	Resonant circuits and transient response	04	04	04	12
6	Filters and Attenuators	04	06	04	14
	Total	**18**	**20**	**22**	**60**

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Perform Mesh analysis for given circuits.	02
2	1	CO1	Perform Node analysis for given circuits.	02
3	2	CO2	T to π-network conversion for the given network Theoretically with [Proof of equations] practical verification by applying same input.	02
4	3	CO3	Verify Norton's theorem and compare practical and theoretical values	02
5	3	CO3	Verify Superposition theorem and compare practical and theoretical values.	02
6	3	CO3	Verify Maximum power transfer theorem and compare practical and theoretical values	02
7	3	CO3	Verify Thevenin's theorem and compare practical and theoretical values.	02
8	4	CO3	Verify Theoretical relationship and definitions of Z /Y parameters with Practical calculations.	02
9	4	CO3	Verify Theoretical relationship and definitions of H /ABCD parameters with Practical calculations.	02
10	5	CO4	Plot resonance curves of series R-L-C circuit and find out Q, f_0 and bandwidth.	02
11	5	CO4	Plot resonance curves of parallel R-L-C circuit and find out Q, f_0 and bandwidth.	02
12	6	CO4	Calculate attenuation factor theoretically & verify practically for a T / π type attenuator.	02
13	6	CO4	Derive, design and plot frequency response of low pass filter / high pass filter	02

14	6	CO4	Plot frequency response and find cut off frequency of band pass filter with theoretical analysis.	02
15	6	CO4	Plot frequency response and find cut off frequency of band stop filter with theoretical analysis.	02
Total				**30**

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and CO's. Remaining 4 experiments are to be performeddepending on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Fundamentals of Electric Circuits Theory	Chatoppadhya, S. Chand and Co. Ltd. New Delhi, 1998	8121900085
2	Networks, Fields and Circuits.	John Ryder, Prentice Hall of India Ltd., 2nd Edition, 2005	9332559511
3	Transmission Lines	Umesh Sinha, Satya Publication, 1st Edition, 2010	9788176841887
4	Network Systems	D. Roy Choudhari, New Age International, 4th edition, 2009	9781906574246

E-References:

1. https://nptel.ac.in/courses/108102042/
2. https://www.electronics-tutorials.ws/
3. https://www.youtube.com/watch?v=ZzMJtQ_7MiA
4. https://mrcet.com/downloads/digital_notes/HS/5%20Electrical%20Circuits.pdf
5. http://www.ee.iitm.ac.in/videolectures/doku.php?id=ee2015_2017nk:start

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	1				1	1	1	1
CO2	2	2	1				1	1	1	1
CO3	2	2	1	1			1	2	2	2
CO4	2	3	3	1			1	2	1	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Prof. Anjum Mujawar	Managing Director	Discover Projects
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4	Dr. H. M. Pardeshi	Lecturer Electronics	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

Programme: **Diploma in Electronics engineering (Sandwich Pattern)**										
Course Code : **EC19205**				Course Title: **Electronic Measurements and Instruments**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (1 Hr)	TS1 (30min)	TS2 (30min)	PR	OR	TW	Total
3	**2**	**-**	**5**	**60@**	**20@**	**20@**	**-**	**25**	**25**	**150**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This course is introduced to provide practical information and technical background of some of the conventional as well as specialized testing and measuring instruments. It also provides the basic concepts, principles, architecture, procedures, and techniques for the measurement of various electronic quantities using analog and digital electronic measuring instruments. The student will be familiarized for selecting and operating the appropriate measuring instrument. This subject presumes that the students are familiar with basic utilization of measuring instruments.

Course Outcomes: Student should be able to

CO1	Classify various instruments.
CO2	Draw the constructional diagram and describe the working principle of analog meter.
CO3	Describe operation of different digital meters.
CO4	Describe various functions of CRO for various applications.
CO5	Draw block diagram of signal generator and IC tester and describe its working.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Basics of Measurement :** 1.1 Classification of Instruments: Absolute , Secondary Instruments 1.2 Definitions of Static characteristics of Instruments: Accuracy, Precision, Sensitivity, Resolution, Static error, Reproducibility, Drift, Dead Zone. 1.3 Definitions of dynamic characteristics of Instruments: Speed of response, Lag, fidelity, Dynamic error. 1.4 Types of Errors- Gross, Systemic, Random. 1.5 Units of measurement of fundamental quantity. 1.6 Definition of Standards and their classification: International, Primary, Secondary. 1.7 Calibration: Definition, Need of calibration. 1.8 Importance of Grounding. Safety precautions while handling equipment's. **Course Outcomes: CO1 Teaching hours: 6 hrs. Marks: 8(R-4, U-4, A-0)**

2	**Analog DC and AC Meters :** 2.1 Classification of analog ammeter and voltmeter. 2.2 Working principle and construction of PMMC instruments: 2.2.1 Analog DC Ammeter: Shunt resistor type, ArytonShunt type. 2.2.2 Analog DC Voltmeter: Multirange voltmeter : Voltmeter sensitivity, loading effect. 2.2.3 Derivations of deflecting torque of PMMC instruments. 2.2.4 Derivation for calculation of shunt and series resistance. 2.3 Analog AC Voltmeter (No derivation). 2.4 Analog AC Ammeter. 2.5 Analog multimeter: Circuit diagram, operation. 2.6 Output power meter (AF/RF). **Course Outcomes: CO2 Teaching hours: 09 hrs. Marks : 12(R-2, U-8, A-2)**
3	**Digital Meters :** 3.1 Block diagram, operation and applications of: 3.1.1. Digital Frequency meter. 3.1.2. Digital Voltmeter. 3.1.3. Digital Multimeter. 3.2 Advantages and Disadvantages of Digital Instruments. 3.3 Comparison of analog instruments with Digital instruments **Course Outcomes: CO3 Teaching hours:11 hrs. Marks : 12(R-4, U-6, A-2)**
4	**Oscilloscope :** 4.1 CRO: Basic Block diagram and function of each block. 4.2 CRT: Construction and working. 4.3 Vertical Deflection System –Block diagram and operation. 4.4 Horizontal deflection system – Block diagram and operation. 4.5 Function of delay line. 4.6 Explanation of waveform generation 4.7 Applications of CRO: 4.7.1. Time and frequency measurement 4.7.2. Voltage measurement 4.7.3 Lissagous patterns for Phase and Frequency measurement 4.8 Concept, block diagram and Operation of: 4.8.1.Single beam dual trace CRO 4.8.2 Dual beam Dual Trace CRO 4.9 Block diagram, operation advantages and applications of Digital storage oscilloscope. **Course Outcomes: CO4 Teaching hours: 11 hrs. Marks : 16(R-4, U-6, A-6)**
5	**Analog Instruments** : 5.1 Definition and need of signal generator 5.2 Block diagram, operation and applications of : AF and RF type signal generator Function generator, Square and Pulse generator. 5.3 Block diagram, operation and applications of : Spectrum analyzer, Digital IC tester **Course Outcomes: CO5 Teaching hours: 8 hrs. Marks : 12(R-2, U-6, A-4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basics of Measurement	4	4	-	8
2	Analog DC and AC Meters	2	8	2	12
3	Digital Meters	4	6	2	12
4	Oscilloscope	4	6	6	16
5	Analog Instruments	2	6	4	12
	Total	**16**	**30**	**14**	**60**

List of experiments: Total 10 experiments (or turns) out of 14 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Prepare charts of precautionary measures of handling analog meters specifying the importance of grounding.	2
2	1	CO1	Prepare charts of precautionary measures of handling digital meters specifying the importance of grounding.	2
3	2	CO2	To measure voltage current and resistance by analog multimeter.	2
4	3	CO3	To measure voltage current and resistance by Digital multimeter	2
5	4	CO4	Draw the layout of any one section of CRO trainer, check for Continuity and Fault finding	2
6	5	CO5	Draw the block diagram of Function generator. Identify the blocks from circuit. Test and verify function outputs as per specifications	2
7	4	CO4	Draw and label the front panel controls of Dual trace CRO. Measure frequency, voltage, phase difference.	2
8	4	CO4	Observe and draw the front panel controls of Digital Storage oscilloscope and test and verify functionality of controls	2
9	4	CO4	Measure frequency and phase difference of unknown signals with the help of Lissajous pattern by using CRO. Test different components and semiconductor devices using CRO	2
10	4	CO2	To measure voltage and resistance by digital multimeter. List the parameters such as resolution and sensitivity	2
11	5	CO5	To test digital ICs using digital IC tester and various modes of testing.	2
12	5	CO5	To relate use of front panel controls of AF/RF signal generator for various operations and measure frequency generated by it on CRO	2
13	5	CO5	To measure the output power of given circuit using AF/RF output power meter.	2
14	6	CO5	To Calibrate CRO.	2
15	5	CO5	Draw the front panel of Spectrum Analyzer and observe frequency.	2
		Total		**30**

Note: Experiments No. 1 to 6 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Modern Electronic Instrumentation & Measurement Techniques. (Ist edition 2011)	A. D. Helfrick W. D. Cooper , PHI Learning Pvt. Ltd. New Delhi	8120307526
2	Electronic Instrumentation (3rd Edition 2012)	Kalsi H.S., Tata McGraw Hill	9780070702066
3	Electrical & Electronic Measurements & Instrumentation. (14th Edition 2008)	A.K Sawhney ,Dhanpat Rai & Sons	8177001000
4	Instrumentation and Control, (3rd Edition 2012)	S K Singh Industrial , Tata McGraw Hill Education Private Limited, New Delhi	0070262225

E-References:

1) http://en.wikipedia.org/wiki/
2) www.youtube.com/ "here type name of instrument"
3) www.controlnet.com
4) www.tutorialspoint.com

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	1	1	3	1	1
CO2	2	2	3	1	1			2	2	2
CO3	1	1	2	1				2	2	2
CO4			3	3			1	2	2	2
CO5			2	1		1		1	1	1

Industry Consultation Committee:

Sr.No	Name	Designation	Institute/Organisation
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3	Ms Shweta Sisodiya (I/C Curriculum Designer)	Lecturer in Electronics	Govt. Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Electronics.

Head of Department
Department of Electronics.

I/C, Curriculum Development Cell

Principal

Programme: **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19206**				Course Title: **Digital Electronics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30Min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	-	5	60	20	20	25*	-	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This course has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

Course Outcomes: Student should be able to

CO1	Convert number from one number system to another.
CO2	Realize logic circuits using Boolean expressions.
CO3	Build simple combinational logic circuits.
CO4	Verify simple sequential logic circuits.
CO5	Interpret use of different Data converters and memories.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Number Systems and Codes:** 1.1 Number system: Base or radix of number system, binary, octal, decimal and hexadecimal number system. 1.2 Binary Arithmetic: Addition, subtraction. 1.3 Subtraction using 1's complement and 2's complement. 1.4 Codes: BCD, Gray Code, Excess-3 And ASCII code. 1.5 BCD arithmetic: BCD addition. **Course Outcome: CO1 Teaching Hours: 5 hrs. Marks: 8 (R- 0, U-2, A-6)**
2	**Binary Arithmetic:** 2.1 Logic gates: Basic gates (symbol, logical expression, truth table, equivalent circuit using Diode), universal gates (symbol, logical expression, truth table), special purpose gates. 2.2 Universal gates: NOR and NAND gates as universal gates.

	2.3 Boolean algebra: Laws of Boolean algebra, De-Morgan's theorems. 2.4 Logic families: TTL, CMOS, ECL, Characteristics of logic families. **Course Outcome: CO2 Teaching Hours: 10 hrs. Marks: 12(R-4, U-4, A- 4)**
3	**Combinational Logic gates:** 3.1 Standard Boolean representation: Sum of Product (SOP) form, types, Min- term. 3.2 Introduction to K-map: Designing of 2, 3, 4 variable K-map, K-map reduction technique for Boolean expression (Minimization of Boolean functions up to 4 variables) SOP form 3.3 Design of Arithmetic circuits and code converter using K map: Half and Full adder, Half and full subtractor , gray to binary and binary to gray (up to 4 bits) 3.4 Encoder: Introduction, priority encoder, Decimal to BCD encoder. 3.5 Decoder :Introduction, types (2:4, BCD to 7 segment display decoder) 3.6 Multiplexer and Demultiplexer : Working, truth table and applications of multiplexer and demultiplexer , MUX tree, IC 74151 as MUX; DEMUX tree, DEMUX as decoder, 74155 as DEMUX. **Course Outcome: CO3 Teaching Hours: 12 hrs. Marks: 14 (R-4, U-4, A- 6)**
4	**Sequential Logic Circuits:** 4.1 Basic memory cell: R-S latch using NAND. 4.2 Triggering methods: Edge trigger and level trigger. 4.3 SR Flip-Flops: Clocked SR Flip flop with preset and clear. 4.4 JK Flip Flops: JK flip flop, D flip flop, T flip flop, excitation table, MSJK Flip flop. 4.5 Shift Register: Logic diagram of 3- bit shift registers- Serial Input Serial Output, Serial Input Parallel Output, Parallel Input Parallel Output and n-bit universal Shift Register. 4.6 Counters: Asynchronous counter :Up/down Counter, modulus of counter 4.7 Synchronous Counter: Design of 3 bit up/down counter. 4.8 Decade counter: Block schematic of IC 7490-decade counter, IC 7490 as MOD-N Counter. **Course Outcome: CO4 Teaching Hours: 12 hrs. Marks:14 (R-2, U- 6, A-6)**
5	**Data converters and Memories:** 5.1 DAC: Types, weighted resistor circuit and R-2R ladder circuit, DAC IC 0808 Specifications. 5.2 ADC: Block diagram, types and working of dual slope ADC, SAR ADC, ADC IC 0808/0809, specification. 5.3 Memory: RAM and ROM basic building blocks, read and write operation, types of Semiconductor memories. **Course Outcome: CO5 Teaching Hours: 6 hrs. Marks:12 (R- 6, U- 6, A- 0)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Number Systems and Codes.	0	2	6	8
2	Binary Arithmetic.	4	4	4	12
3	Combinational Logic gates.	4	4	6	14
4	Sequential Logic Circuits.	2	6	6	14
5	Data converters and memories.	6	6	0	12
	Total	**16**	**22**	**22**	**60**

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	2	CO2	Verify truth table of NOT, AND, OR, EX-OR, EX NOR, NOR, NAND gates.	2
2	3	CO3	Implement and verify truth table of De-Morgan's theorem.	2
3	3	CO3	Implement simple Boolean expression on bread board.	2
4	3	CO4	Implement and verify truth table of adder and subtractor.	2
5	4	CO4	Implement and verify truth table of RS flip-flop.	2
6	5	CO5	Implement and verify DAC using IC 0808.	2
7	3	CO1, CO3	Design Binary to gray code Converter.	2
8	2	CO2	Construct AND, OR and NOT using NAND /NOR gates.	2
9	3	CO3	Verify truth table of 8:1 multiplexer using IC 74151.	2
10	3	CO3	Design and implement 2:4 decoder.	2
11	3	CO3	To convert given BCD input to binary output and to study LED display using 7447 seven segment decoder/ driver.	2
12	4	CO4	Verify truth table of D flip flop & T flip flop.	2
13	4	CO4	To verify truth table of 3-bit SISO Shift register.	2
14	4	CO4	Verify 3-bit Ring counter using shift register.	2
15	All	CO3, CO4	Micro project.	2
		Total		**30**

Note: Experiments No. 1 to 5 and 15 are compulsory and should map all units and Cos .Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Modern digital electronics.	R.P.Jain,Tata McGraw Hill education, 4 th edition,2013	978-0-07-066911-6
2	Principals of Electronics.	Malvino, Tata McGraw Hill,	0-07-462236-6
3	Digital Design.	M.Moris Mano,PHI Publications,4 thedition 2013	81-203-0835-2
4	Digital electronics circuits and systems.	V.K.Puri, Tata McGraw Hill,1997	0-07-463317-1
5	DigitalElectronics.	Rangnekar S, 1st edition, 2001.	81-88057-03-7

E-References:

1. https://ndl.iitkgp.ac.in/
2. **https://nptel.ac.in**
3. **https://www.allaboutcircuits.com/**
4. **https://www.tutorialspoint.com.**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	2	1	1	1
CO2	3	3	3	3	1	1	3	3	3	2
CO3	2	3	3	3	1	2	3	3	3	2
CO4	3	3	3	3	2	2	3	3	3	2
CO5	2	2	2	2	2	2	3	2	3	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Madhav Patil.	Senior Manager.	Onida company.
2	Smt.Devkule S. S	Lecturer in Electronics.	Govt. Polytechnic Awasari (kh)
3	Smt.Padavi T.Y(Curriculum Content Designer)	Lecturer in Electronics.	Govt. Polytechnic, Mumbai.

Coordinator,
Curriculum Development,
Department of Electronics.

Head of Department
Department of Electronics.

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in CE/ME/CO/IF/EC/EE/IS(Sandwich Pattern)**										
Course Code: **SC19110**				Course Title: **ENGINEERING MATHEMATICS**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**--**	**--**	**4**	**60**	**20**	**20**	**--**	---	**--**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

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Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

CO1	Define the basic principles of function, limits, derivatives, complex number and relations between two variables.
CO2	Apply rules, concept and properties to solve the problems
CO3	Solve the given problems of integration using suitable method.

Course Content Details:

Unit No	Topics / Sub-topics
1	**1. Function** 1.1 Definition of variable,constant,intervals such as open,closed,semi-open etc 1.2 Definition of function,value of function and types of functions and simple examples **Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)**
2	**2. Limits** 2.1 Definition of neighbourhood,concept and definiton of limit 2.2 Limits of Algebraic function 2.3 Limits of Trigonometric Functions with simple examples **Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U-4 , A-4)**
3	**3. Derivatives & Application of derivative** 3.1 Definition of the derivative. 3.2 Derivatives of standard function.(No proof by first principle) 3.3 Differentiation of sum, difference, product and quotient of two or more functions 3.4 Differentiation of composite function with simple example. 3.5 Second order derivative. 3.6 Geometrical Meaning of Derivative 3.7 Tangents & Normals to the curve, 3.8 Maxima & minima of the function 3.9 Radius of curvature **Course Outcome: CO2 Teaching Hours : 10 hrs Marks:10 (R-4 , U- 4 , A-2)**
4	**4. Integration & Application of integration** 4.1 Definition of integration as antiderivative ,Integration of standard function 4.2 Rules of integration(Integration of sum, difference,scalar multiplication) without proof 4.3 Integration by substitution 4.4 Integration of composite function 4.5 Definiton of definite integral 4.6 Properties of definite integral with simple problems 4.7 Area under the curve 4.8 Area bounded by two curves **Course Outcome: CO3 Teaching Hours :10 hrs Marks:10 (R-4, U- 4 , A-2)**
5	**5. Complex Number:-** 5.1 Definition of complex number Cartesian ,Polar ,Exponential form of complex number 5.2 Algebra of complex number :-Equality , addition ,Substraction ,Multiplication & Division with simple examples **Course Outcome: CO2 Teaching Hours :10hrs Marks:10 (R- 2 , U-4 , A-4)**
6	**6. Numerical Analysis** 6.1 Solution of Algebraic equations using – i) Bisectional method ii) Regular – Falsi method , iii) Newton- Raphson method 6.2 Solution of simultaneous equation (i) Gauss elimination method (ii) Jacobi's method (iii) Gauss-Seidal method **Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4 , A- 4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Function**	04	04	02	10
2	**Limits**	02	04	04	10
3	**Derivatives & Application of Derivatives**	04	04	02	10
4	**Integration & Application of Integration**	04	04	02	10
5	**Complex Number**	02	04	04	10
6	**Numerical Analysis**	02	04	04	10
	Total	**18**	**24**	**18**	**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students (Volume I)	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

E-References:

1. www.math-magic.com
2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1		1
CO2	3			1			1	1		1
CO3	3			1			1	1		1

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			1			1	1	
CO2	3			1			1	1	
CO3	3			1			1	1	

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1	1	
CO2	3			1			1	1	1	
CO3	3			1			1	1	1	

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1		1
CO2	3			1			1	1		1
CO3	3			1			1	1		1

CO Vs PO and CO Vs PSO Mapping (ELCTRONICS ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1		1	1
CO2	3			1			1		1	1
CO3	3			1			1		1	1

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1		1	
CO2	3			1			1		1	
CO3	3			1			1		1	

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			1			1	1	1
CO2	3			1			1	1	1
CO3	3			1			1	1	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement ltd. Mumbai Head Office
2	Mrs. Deepawali S. kaware	Lecturer in Mathematics	Government polytechnic Vikaramgad
3	Mr. A.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr.V.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Departments
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(Third Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme : Diploma in Electronics Engineering (Sandwich Pattern)Term / Semester - III

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19301	Applied Electronics.	4	2	0	6	6	60	20	20	50	0	25	175
EC19208	Introduction to Communication	4	2	0	6	6	60	20	20	0	25*	25	150
EC19401	Microcontroller @	3	2	0	5	5	60@	20@	20@	25	0	25	150
EC19302	Linear Integrated Circuits and Applications.	3	4	0	7	7	60	20	20	50*	0	25	175
HU19102	Environmental Studies.	0	2	0	2	2	0	0	0	0	25	25	50
EC19402	Linux (MOOC) #	0	4#	0	4#	4	0	0	0	0	0	0	0
	Total	**14**	**16**	**0**	**30**	**30**	**240**	**80**	**80**	**125**	**50**	**125**	**700**
Student Centered Activity(SCA)					**05**								
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19301**				Course Title: **Applied Electronics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**50**	-	**25**	**175**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid-term and second skill test at the end of the term

Rationale:

This course deals with operating principle and application of electronic circuits such as amplifiers, oscillators, switching circuits, wave shaping circuits. The subject knowledge is required in Electronics, Instrumentation and Communication system. The learning of basic operating principles of electronic circuits will help the students to use the basic electronic equipment. It also help students to study, understand and comprehend the fundamentals of various facts, the basic concepts and rules of electronic circuits.

Course Outcomes: Student should be able to

CO1	Describe the BJT amplifiers and RF Amplifier.
CO2	Use of Power amplifiers and Feedback amplifiers.
CO3	Interpret the operation of Sinusoidal and Non-sinusoidal oscillators.
CO4	Explain the working of different Time base generators.

Course Content Details:

Unit No	Topics / Sub-topics
1	**BJT Amplifiers:** 1.1 Cascade amplifiers (Multistage amplifiers): 1.1.1 Need and effect on parameter like gain, bandwidth, noise. 1.1.2 Types of amplifier coupling: 1.1.2.1 RC coupled 1.1.2.2 Direct coupled 1.1.2.3 Transformer coupled. (Circuit diagram, working principle, frequency response, application, advantages and disadvantages) 1.2 Two stage amplifiers: 1.2.1 RC coupled 1.2.2 Direct coupled 1.2.3 Transformer coupled. (Circuit diagram, working principle, frequency response, merits, demerits and applications) 1.3 Introduction to two port network: The h-parameter of linear circuits, its determination and meaning-parameter of transistor, hybrid equivalent circuit for CE transistor, hybrid formulas

	for voltage divider biased CE amplifier **Course Outcome: CO1 Teaching Hours:12 Marks:10 (R- 4, U-4, A-2)**
2	**RF Amplifiers:** 2.1 Introduction and necessity of tuned (RF) amplifiers 2.2 Basic tuned circuit, series and parallel resonance in tuned circuits. 2.3 Parallel circuit: Definition, formulae and simple numerical on resonance curve, bandwidth and sharpness of resonance. 2.4 Operating principle, circuit diagram, working and resonance frequency of single tuned, double tuned and stager tuned amplifiers. **Course Outcome: CO1 Teaching Hours:08 Marks:06 (R-2, U- 2, A-2)**
3	**Power Amplifiers:** 3.1 Introduction, Graphical representation and efficiency of: 3.1.1 Class A 3.1.2 Class B 3.1.3 Class AB 3.1.4 Class C 3.2 Circuit operation, input / output waveform, graphical analysis and efficiency of: 3.2.1 Transformer coupled resistive load single stage power amplifier 3.2.2 Class B push pull amplifier 3.2.3 Class AB push pull amplifier 3.3 Concepts of cross over distortion, advantage of push pull amplifiers. 3.4 Collector power dissipation, requirement and specification of power transistors. 3.5 Need of heat sink. **Course Outcome: CO2 Teaching Hours:10 Marks:14 (R-6, U-8, A--)**
4	**Feedback Amplifiers:** 4.1 General theory of feedback: Types of feedback- negative and positive feedback. 4.2 Types of negative feedback: Block diagram of voltage shunt, voltage series, current shunt and current series. 4.3 Effect of negative feedback on CE amplifier due to emitter bypass capacitor and emitter resistor. 4.4 Effect of negative feedback on amplifiers: Voltage gain, bandwidth, input impedance, output impedance, stability, noise, distortion. (No derivation to be asked in the examination. Simple numerical on the end expression.) **Course Outcome: CO2 Teaching Hours:08 Marks:08 (R-2, U-4, A-2)**
5	**Oscillators:** 5.1 Introduction of oscillator: Sinusoidal and Non-sinusoidal oscillator, block diagram of sine wave oscillator, requirement of oscillation- Barkhausen criteria. 5.2 Operating principles, circuit diagram and application of: 5.2.1 RC phase shift oscillator 5.2.2 Hartley oscillator 5.2.3 Colpitts oscillator 5.2.4 Wein bridge oscillator 5.2.5 Crystal oscillator. 5.3 Multivibrator: Classification, circuit, working principle, waveforms and application of Astable, Monostable and Bistable multivibrator (Using transistor).

	5.4 Working principle, circuit diagram and application of Schmitt trigger. **Course Outcome: CO3 Teaching Hours:16 Marks:14 (R-4 , U-6, A-4)**
6	**Time base generator:** 6.1 Circuit diagram, Working principle, operation and application of: Exponential sweep (voltage time based) generator, UJT Relaxation oscillator, Transistor Current sweep, Miller time base generator and Bootstrap sweep generator. **Course Outcome: CO4 Teaching Hours:06 Marks:08(R-4, U-4, A--)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**BJT Amplifiers**	4	4	2	10
2	**RF Amplifiers**	2	2	2	06
3	**Power Amplifiers**	6	8	-	14
4	**Feedback Amplifiers**	2	4	2	08
5	**Oscillators**	4	6	4	14
6	**Time base generator**	4	4	-	08
	Total	**22**	**28**	**10**	**60**

List of experiments: Total 10 experiments out of 15 experiments

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To plot frequency response of RC coupled amplifier. Calculate gain and bandwidth.	02
2	3	CO2	Find output power gain and bandwidth of transformer coupled Class-A power amplifier and.	02
3	5	CO3	Calculate output frequency of RC phase shift oscillator.	02
4	6	CO4	To calculate the output frequency of relaxation oscillator	02
5	3	CO1	To plot frequency response of Class-C power amplifier(tuned amplifier)	02
6	3	CO2	To test parameters of Class AB push pull amplifier using transistor.	02
7	4	CO2	To plot frequency response and bandwidth of negative feedback using two stage RC coupled amplifiers.	02
8	5	CO3	Calculate output frequency of Wien bridge/ Colpitt/ Hartley oscillator.	02
9	5	CO3	Observe the output waveforms and verify the frequency of Astable multivibrator.	02

10	5	CO3	Verify the time period of Monostable multivibrator.	02
11	5	CO3	Observe the input and output waveforms for Bistable multivibrator circuit.	02
12	5	CO3	Calculate UTP and LTP of Schmitt trigger circuit.	02
13	1-5	CO1, CO2, CO3, CO4	Mini Project: Frequency generator using Oscillators, Construct doorbell using Transistor, etc or any topic suggested by faculty. (testing on bread board , soldering on PCB etc)	02
14	1-5	CO1, CO2, CO3, CO4	Mini Project: Frequency generator using Oscillators, Construct doorbell using Transistor, etc or any topic suggested by faculty. (trouble shooting , report preparation etc)	02
15	1-5	CO1, CO2, CO3, CO4	Case Study (Market survey of different electronics circuits)	02
Total				**30**

Note: Experiments No. 1 to 5 and 13 to 15 are compulsory and should map all units and COs. Remaining experiments are to be performed depending on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronics Principles	Malvino, Albert Paul, David (McGraw Hill Education)	9780073373881
2	Principles of Electronics	Mehta V.K., Mehta Rohit (S. Chand and Company)	978-81-219-2450-4
3	Fundamentals of Electronic Devices and Circuits	Bell , Devid (Oxford University Press)	0195425235, 9780195425239
4	A text book of Applied Electronics	Sedha R.S. (S. Chand)	81-219-2783-8

E-References:

1. https://ndl.iitkgp.ac.in/
2. www. electronicshub.org/tutorials/
3. www.tutorialspoint.com/
4. www.youtube.com

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	3	2	3	2

CO2	3	3	3	2	1	2	3	3	3	2
CO3	3	3	3	2	1	3	3	3	3	2
CO4	3	3	3	2	1	2	3	2	3	3

Industry Consultation Committee:

Sr. No	**Name**	**Designation**	**Institute/Organisation**
1	Mrs. Salunke Suvarna	Sr. Controls Engineer	Vanderlande Industries Software Pvt Ltd.Pune
2	Mrs. Chavhan Monali	Lecturer in Electronics	Government Polytechnic, Vikramgadh
3	Mrs. Puri Sanyogeeta B.	Lecturer in Electronics	Govt. Polytechnic Mumbai

Coordinator, Head of Department

Curriculum Development, Department of Electronics Engineering

Department of Electronics Engineering

I/C, Curriculum Development Cell Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19208**				Course Title: **Introduction to Communication**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2hrs 30mins)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**-**	**25***	**25**	**150**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Communication field is fast growing and dynamic in nature playing vital role in improving our lives. This course is designed to meet the intention of developing fundamental concepts, understanding of various analog, pulse and digital communication systems. It is very essential that student of electronics should learn and develop the skills to use the electronic communication system**.**

Course Outcomes: Student should be able to

CO1	Describe analog, pulse modulation techniques and multiple access techniques.
CO2	Understand the basic concepts of Digital Modulation like error detection, error correction, line coding and modulation techniques etc.
CO3	Discuss different types of wave propagation used for transmission and reception of signal.
CO4	Select relevant antenna for specific application.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Communication System and Analog Modulation Techniques** 1.1 Introduction to Communication System: 1.1.1 Electromagnetic Spectrum 1.1.2 Block Diagram and description of Communication System 1.1.3 Types of communication system: Simplex, Duplex (Half/Full), Analog and Digital, Wire and Wireless Communication 1.2 Noise: 1.2.1 Sources of Noise (internal and external) 1.2.2 Define: Noise, Signal to noise ratio (SNR), Noise factor, and Noise figure. 1.3 Modulation: 1.3.1 Need for modulation 1.3.2 AM: Definition, Waveform, Mathematical representation, Modulation Index, Bandwidth requirement, Representation of AM signal in Time and frequency domain, Total power required for AM wave, simple numerical, Advantages, Disadvantages and

	Applications 1.3.3 FM: Definition, Waveform, Bandwidth requirement, Representation of FM signal in Time and frequency domain, Advantages, Disadvantages and Applications 1.3.4 PM: Definition 1.4 Radio receiver: Block diagram, working and waveforms of 1.4.1 AM Super heterodyne radio receiver 1.4.2 FM radio receiver **Course Outcome: CO1 Teaching Hours : 11 hrs Marks: 12 (R-6 , U- 4, A-2)**
2	**Pulse Modulation and Multiple Access Techniques** 2.1 Pulse Modulation: 2.1.1 Sampling theorem, Nyquist criteria (only statement) 2.1.2 Pulse analog modulation: Generation block diagram, waveforms, advantages, disadvantages and applications of PAM, PWM and PPM signal. (No Numerical) 2.2 Pulse Code Modulation: 2.2.1 Quantization process, Quantization Noise, 2.2.2 PCM:Transmitter, Receiver Block diagram, working principle, advantages, disadvantages & application 2.2.3 Delta modulation and Adaptive delta modulation: Block diagram, working principle, advantages, disadvantages 2.3 Multiple Access techniques: Definitions, schematic diagram of 2.3.1 TDMA 2.3.2 FDMA 2.3.3 CDMA 2.3.4 Comparison between TDMA, FDMA and CDMA. **Course Outcome: CO1 Teaching Hours :11hrs Marks: 10 (R-0, U-6, A-4)**
3	**Fundamental of Digital Communication System and Coding Methods** 3.1 Digital communication system: 3.1.1 Block diagram, advantages and disadvantages 3.2.2 Communication channel characteristics: Define - bit rate, baud rate, and bandwidth. 3.2 Channel / Line coding: 3.2.1 Error, causes of error and its effect 3.2.2 Error detection and correction using parity, Vertical redundancy check (VRC), Longitudinal redundancy check and Cyclic redundancy check (CRC) 3.3 Line coding formats: Waveforms of 3.3.1 Unipolar – RZ, NRZ 3.3.2 Polar –NRZ-I, NRZ-L and RZ 3.3.3 Manchester (split phase), AMI **Course Outcome:CO2 Teaching Hours :11hrs Marks: 10 (R-2 , U-4 , A-4)**

4	**Introduction to Digital Modulation Techniques** 4.1 Digital modulation techniques: 4.1.1 Types of Digital modulation techniques 4.1.2 Concept of coherent and non-coherent detection. 4.2 Shift keying techniques (ASK, FSK, BPSK): 4.2.1 Transmitter and receiver block diagram, working principle and waveforms 4.2.2 Advantages, Disadvantages and Applications 4.2.3 Comparison of ASK, FSK, BPSK **Course Outcome: CO2 Teaching Hours: 09 hrs. Marks: 10 (R- 4, U-4, A-2)**
5	**Wave propagation** 5.1 Concept of propagation of radio waves 5.2 Ground wave propagation: Schematic diagram, Advantages and Applications 5.3 Sky wave propagation (Schematic diagram, Advantages and Applications): 5.3.1 Ionospheric layers 5.4 Space wave propagation (Schematic diagram, Advantages and Applications): 5.4.1 Line of sight 5.4.2 Multipath space wave propagation 5.5 Introduction to Duct wave propagation: 5.6 Introduction to Tropospheric Scatter Propagation: **Course Outcome: CO3 Teaching Hours: 08 hrs. Marks: 10 (R- 4, U-6, A-0)**
6	**Antennas** 6.1 Antenna Fundamentals: 6.1.1 Isotropic antenna 6.1.2 Resonant antenna and Non resonant antenna, 6.2 Definition of different Antenna Parameters: 6.2.1 Radiation Pattern 6.2.2 Polarization 6.2.3 Band width 6.2.4 Beam width 6.2.5 Antenna resistance 6.2.6 Directivity 6.2.7 Power gain 6.2.8 Antenna gain **6.3** Antenna (Construction, radiation pattern and applications): 6.3.1 Half wave dipole antenna 6.3.2 Folded dipole antenna 6.3.3 Loop antenna 6.3.4 Yagi-Uda antenna 6.4 Microwave Antenna (Construction, radiation pattern and applications): 6.4.1 Dish antenna 6.4.2 Horn antenna 6.4.3 Microstrip Patch antenna – Rectangular, square and circular **Course Outcome: CO4 Teaching Hours : 10 hrs Marks: 08 (R- 2, U-4, A-2)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Communication System and Analog Modulation Techniques	6	4	2	12
2	Pulse Code Modulation and Multiple Access Techniques	0	6	4	10
3	Fundamental of Digital Communication System and Coding Methods	2	4	4	10
4	Introduction to Digital Modulation Techniques	4	4	2	10
5	Wave propagation	4	6	-	10
6	Antennas	2	4	2	8
	Total	**18**	**28**	**14**	**60**

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	To calculate modulation index of AM wave.	2
2	2	CO2	To study different line coding formats.	2
3	5	CO3	A case study on –Discuss any mode of wave propagation used for transmission and reception of signal or any topic suggested by faculty related to chapter no.5	2
4	6	CO4	Use any software to plot radiation pattern of antenna	2
5	6	CO4	Use any software to plot radiation pattern of antenna	2
5	3	CO2	To observe the waveform of ASK signal.	2
7	1	CO1	To observe the waveform of FM wave.	2
8	2	CO1	To observe the waveform of PAM signal.	2
9	2	CO1	To observe the waveform of PWM signal.	2
10	2	CO1	To observe the waveform of PPM signal.	2
11	4	CO2	To observe the waveform of FSK signal.	2
12	4	CO2	To observe the waveform of BPSK signal.	2
13	6	CO4	To plot radiation pattern of half wave dipole and folded dipole antenna.	2
14	All	CO1, CO2. CO3, CO4	A mini project on – to build any modulation circuit on PCB (eg. AM, FM, PAM, PWM etc.) / any topic suggested by faculty. (testing on bread board , soldering on PCB etc)	2

15	All	CO1, CO2, CO3, CO4	A mini project on – to build any modulation circuit on PCB (eg. AM, FM, PAM, PWM etc.) / any topic suggested by faculty. (trouble shooting , report preparation etc)	2
		Total		**30**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronic Communication Systems	Kennedy, Davis, Mc-Graw Hill, 2011	978-0071077828
2	Digital Communication	Simon S. Haykin, Wiley	978-0471647355
3	Principles of Digital Communication and coding	Andrew Viterbi, Mc-Graw Hill	978-0070675162
4	Electronic Communication Systems	Thomasi, Wayne, Pearson Education , India, Delhi	978-8131719534
5	Digital Communication	Sklar, Bernald, Pearson Education , India, 2014	978-1292026060
6	Principles of Digital Communication Systems	Taub, Schilling, Mc-Graw Hill	9780071003131
7	Antenna Theory	Constantine A, Balanis, Tata Mc-Graw Hill, 2015	978-8126524228
8	Antenna and Wave Propagation	K. D. Prasad, Satya Prakashan	9788176840255

E-References:

1. www.turbofuture.com/industrial/Elements-of-Electronic-Communication-System
2. Multiple access:-www.youtube.com/watch?v=vtiup l wlc4E
3. Multiple access:-www.youtube.com/watch?v=AKXFwwcww E
4. CDMA: Multiple access:-www.youtube.com/watch?v=dbc9P3U-Xo
5. Digital Modulation technique:www.youtube.com/watch?v=GLnGVB92K78
6. Video lecture: www.nptlvidios.in/communication engineering.
7. Hamming code: www.youtube.com/watch?v=lA_NcXxdoCc
8. www.antenna-theory.com/basics/main.php
9. Digital communication tutorial: www.nptlvideos.in/2012/12/ digital communication
10. Antennas; https://youtu.be/sRX2EY5Ubto

CO vs PO and CO vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	2	2	2	2
CO2	3	3	2	2	2	1	2	2	2	2
CO3	3	1			2	1	3	1	2	
CO4	3	1	1	1	3	1	2	2	2	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Milind R. Patil	Sr. Manager	JSW Steel Works, Dolvi , Pen, Raigad
2	Mr. A.D. Vikhandkar	Selection Grade Lecturer	Government Polytechnic Pen.
3	Mrs. Pranali Gahukar	Lecturer	Government Polytechnic Pen
4	Mrs. Suvidha M. Patil	Selection Grade Lecturer	Government Polytechnic Mumbai.

Coordinator,
Curriculum Development,
Department of Electronics Engineering

Head of Department
Department of Electronics Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19401**				Course Title : **MICROCONTROLLER**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	**P**	**TU**	**Total**	**TH (2Hrs 30 Min)**	**TS1 (1 Hr)**	**TS2 (1 Hr)**	**PR**	**OR**	**TW**	**Total**
3	**2**	**--**	**5**	**60@**	**20@**	**20@**	**25**	**--**	**25**	**150**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This course deals with architecture and applications of 8051 Microcontroller As the technology is changing, many electronic gadgets are now Microcontroller based for automation in every field of engineering. So it will be beneficial for students to learn the architecture, programming, interfacing & real world applications of Microcontroller.

Course Outcomes: Student should be able to

CO1	Comprehend the concepts and basic architecture of Microprocessor and Microcontroller
CO2	Describe the Memory organization of Microcontroller
CO3	Recalls 8051 instruction set & Develop programs of 8051 Microcontroller
CO4	Describe the timer, interrupt and serial ports/parallel ports of 8051 Microcontroller
CO5	Interface Memory and I/O devices to 8051 as per requirements

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Microcontrollers** 1.1 Introduction to microprocessors and Microcontrollers 1.2 Comparison of Microcontrollers and Microprocessors 1.3 Basic architecture 1.3.1 Microcontroller 1.3.2 Microprocessor 1.3.3 Harvard Vs Princeton architecture 1.3.4 8051 Microcontroller 1.3.5 Internal architecture of 8051 1.3.6 Micro coded and hard coded processor 1.3.7 Pin configuration of 8051 Microcontroller

	1.4 Types of buses **Course Outcome: CO1 Teaching Hours :08 hrs Marks: 10 (R- 4, U-4, A-2)**
2	**Memory Organization** 2.1 Memory types 2.1.1 ROM 2.1.2 EPROM 2.1.3 EEPROM 2.1.4 Flash 2.1.5 RAM 2.2 Internal RAM structure 2.3 Special Function Register map 2.4 Stack 2.5 Processor status word **Course Outcome: CO2 Teaching Hours :06 hrs Marks: 10 (R-04, U-04,A-02)**
3	**8051 Instruction set and programming:** 3.1 Addressing Modes (register, direct, indirect, immediate) 3.2 Assembler directives (ORG, DB, EQU, END) 3.3 8051 instruction set 3.3.1 Data transfer instructions, 3.3.2 Arithmetic instructions, 3.3.3 Logical instructions, 3.3.4 Branch instructions, 3.3.5 Boolean instructions, 3.3.6 Stack operation instructions 3.3.7 Machine control instructions 3.4 Assembly language programs **Course Outcome: CO3 Teaching Hours :09 hrs Marks: 12(R- 02, U-02,A-08)**
4	**8051 Interrupts and Timers/counters:** 4.1 Basics of interrupts 4.1.1 Schematic representation 4.1.2 Types (external interrupts and internal interrupts) 4.1.3 Priority level structure 4.1.4 Interrupt Enable register (IE) 4.1.5 Interrupt priority register (IP)

	4.2 Timers / Counters 4.2.1 Timer Modes 4.2.2 Timer Control (TCON) 4.2.3 Timer mode control (TMOD) **Course Outcome: CO4 Teaching Hours : 08 hrs Marks: 10 (R-2, U- 04,A-04)**
5	**8051 Serial Communication:** 5.1 Serial interface 5.1.1 serial port control register (SCON) 5.1.2 Power mode control register (PCON) 5.1.3 Serial buffer register (SBUF) 5.1.4 Modes of serial communication 5.2 Simple programs on serial communication (using UART, Virtual port, etc...) **Course Outcome: CO4 Teaching Hours : 06 hrs Marks: 08 (R-02, U-02, A-04)**
6	**Memory and I/O Interfacing with 8051 and Application** 6.1 Memory interfacing 6.2 I/O interfacing with 8051 (interfacing diagram and programming) 6.2.1 LED 6.2.2 LCD 6.2.3 Seven Segment Display 6.2.4 Stepper motor 6.2.5 DC motor 6.3 Simple programs on waveform generation 6.4 A case study on Microcontroller 8051 **Course Outcome: CO5 Teaching Hours : 08 hrs Marks: 10 (R- 02,U-02,A-06)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Microprocessors and Microcontrollers	4	4	2	10
2	Memory Organization	4	4	2	10
3	8051 Instruction set and Programming:	2	2	8	12
4	8051 Interrupts and Timers/counters:	2	4	4	10
5	8051 Serial Communication:	2	2	4	08
6	Memory and I/O Interfacing with 8051 and applications	2	2	6	10
	Total	**16**	**18**	**26**	**60**

List of experiments/Assignments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,2,3	1,2,3	Write assembly language program (ALP) to perform following Arithmetic operations on 8 bit data : Addition, subtraction, Multiplication and Division	02
2	2,3	2,3	Write a ALP to perform to transfer data bytes from source to destination	02
3	2,3	1,2,3	Write a ALP to find smallest/largest number in given data bytes stored in internal data memory.	02
4	3,4	3,4	Write a ALP develop ALP to generate square wave by using timer delay	02
5	3,6	1,3,5	Develop a program to interface Input Switches and output LEDs with 8051	02
6	3,6	1,3,5	Write a program for DC motor interfacing with Microcontroller	02
7	3,6	1,3,5	Write a program for interfacing with stepper motor Microcontroller	02
8	3,6	1,3,5	Interface 7 segment display with8051 and Write a program to count and display 0 to 9 on it.	02
9	3,6	1,3,5	Write a program for interfacing LCD with Microcontroller to display the given string	02
10	3,6	1,3,5	Write a program for interfacing Keyboard with 8051 to Microcontroller and display the key pressed.	02
11	3,6	1,3,5	Write alp for interfacing ADC	02
12	3,6	1,3,5	Write ALP for interfacing DAC	02
13	3,6	1,3,5	Write a program for interfacing 4x4 Keypad and 16X2 LCD with 8051 Microcontroller.	02
14	3,5	1,3,4	Write ALP for serial communication	02
15	3,5	1,3,4,5	Mini Project	02
			Total	**30**

Note: Experiments No. 1 to 5 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Name of Book	Author	Publisher	ISBN
1	Microcontrollers: Architecture, Programming, Interfacing and System Design	Rajkamal	Pearson Education	9788131706978
2	The 8051 Microcontroller and embedded system	MuhammadAli Mazidi	Pearson India	9788131710265
3	The 8051 Microcontroller	Kenneth J. Aayala	Thomson	978-1401861582
4	Programming and customizing The 8051 Microcontroller	Myke Predko	TataMcGraw-	9780070421400

			Hill	

E- References

1. Simulation software:-www.kcil.com
2. Microcontroller:- wwfaqs.org/microcontroller
3. Microcontroller:- www.nptel.ac.in/courses/webcourse contents/llTKANPUR/ microcontrollers / micro/ui/Course home25html
4. Memory:- www.s1ideshare.net/aismahesh/memory-8051
5. Microcontroller instructions:-www.electrofriends.com/artic1es/electronics/microcomroller-electronics-articles/80518951/80518951-microcontroller-instruction-set
6. Microcontroller project:- www.8051 project.net/downIoad-c4-8051 -projccts.html

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	-	1	1	1	-	1	1
CO2	2	1	2	1	1	1	2	1	2	2
CO3	2	1	3	3	2	2	3	3	3	3
CO4	2	1	2	2	2	1	1	2	2	2
CO5	2	1	3	3	2	2	3	2	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
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3	Smt. P. A. Khande (Curriculum Content Designer)	Lecturer in Electronics	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Electronics Engineering

Head of Department
Department of Electronics Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19302**				Course Title: **Linear Integrated Circuits and Applications**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30Min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**4**	**--**	**7**	**60**	**20**	**20**	**50***	--	**25**	**175**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Operational amplifier is most commonly used linear IC in electronic circuits and equipment. To maintain linear electronic circuit it is essential to study the performance of operational amplifiers. Therefore this course deals with all those aspects of amplifiers with various configurations and applications such as comparators, timers, active filters, PLL etc. This course develops the skills such as build, test and observe the output of given electronic circuit using operational amplifier and timer.

Course Outcomes: Student should be able to

CO1	Understand the basic principle of Operational Amplifiers.
CO2	Describe working principle of OPAMP circuits, Active Filters and PLL.
CO3	Explain working principle of Timer IC555 and its types.
CO4	Implement nonlinear applications of OPAMP.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Operational Amplifier (OPAMP):** 1.1 Introduction to Op-Amp: 1.2 Differential amplifiers: Four Configurations and circuit diagram. 1.3 Op-Amp: Equivalent Circuit, Symbol. 1.4 Block diagram of OPAMP : 1.4.1 Functions of each block 1.4.2 Circuit diagram and working principle of each block 1.5 IC: 741 pin diagram and pin description: 1.6 Ideal OPAMP: electrical characteristics: 1.7 Definitions of OPAMP parameters: Input offset voltage, Input offset current, Input bias current, CMMR, SVRR, large signal voltage gain, output voltage swing, slew rate etc. 1.8 Ideal voltage transfer curve:

	Course Outcome: CO1 Teaching Hours :10 hrs Marks: 12 (R- 06, U-06, A-)
2	**OPAMP Circuits:** 2.1 Configurations of OPAMP: 2.1.1 Open loop 2.1.2 Closed loop 2.2 Virtual ground concept 2.3 Circuit diagram, Working principle , output expression, applications and simple numerical of : 2.3.1 Close loop Inverting amplifier, 2.3.2 Close loop Non-Inverting amplifier, 2.4 Circuit diagram, working, output expression and simple numerical of: 2.4.1 Unity gain amplifier 2.4.2 Inverter (Sign changer) 2.4.3 Inverting summing amplifier (Scaling or Averaging amplifier) 2.4.4 Non-Inverting Adder 2.4.5 Subtractor (Differential amplifier) 2.5 Circuit diagram, working principle, output expression and Output waveform for sine, square wave input: 2.5.1 Active Integrator 2.5.2 Active Differentiator 2.6 Instrumentation Amplifiers (using 3- OP AMP): Circuit diagram, working principle, output expression and applications. 2.7 Circuit diagram, working principle, output expression and applications of: 2.7.1 V-to-I converter (Grounded load and Floating load) 2.7.2 I-to-V converter 2.7.3 Log Amplifier 2.7.4 Antilog Amplifier 2.7.5 Sample and Hold Circuit using Op-amp (Note: All circuit must be explain with derivation) **Course Outcome:CO2 Teaching Hours:11 hrs Marks: 14 (R-04, U-06,A-04)**
3	**Comparators and Detectors:** Circuit diagram, working principle and applications of: 3.1 Inverting and Non-Inverting comparator 3.2 Zero crossing detector (Inverting and Non-Inverting) 3.3 Schmitt trigger (Inverting Only) 3.4 Phase detector 3.5 Peak detector (positive and negative), peak to peak detector **Course Outcome: CO4 Teaching Hours: 6 hrs Marks: 10 (R-02, U-04, A-04)**
4	**Timers and Phase Locked Loops** 4.1 IC 555: 4.1.1 Block diagram and description 4.1.2 Pin diagram and pin description 4.1.3 Applications. 4.2 Types of IC 555 (on the basis of modes of operation): Circuit diagram, working principle, waveform, and simple numerical

	4.2.1 Astable mulitvibrator: Expression for output frequency 4.2.2 Monostable multivibrator: Expression for ON time 4.2.3 Bistable multivibrator 4.3 Introduction to PLL: 4.3.1 Basic working principle 4.3.2 Block diagram 4.3.3 PLL transfer curve 4.3.4 Applications 4.4 IC 565 (phase lock loop):Block diagram, pin diagram and pin description 4.5 Block diagram and working principle of : 4.5.1 Frequency multiplier 4.5.2 FM demodulator. **Course Outcome: CO2, CO3 Teaching Hours: 10 hrs. Marks: 10 (R-02, U- 04,A-04)**
5	**Active Filters using OPAMP:** 5.1 Introduction to Active Filter: 5.1.1 Merits & demerits of active filters over passive filters 5.1.2 Classification of filters 5.1.3 Applications 5.2 Frequency response (ideal and actual) of: 5.2.1 Low Pass Filter 5.2.2 High Pass Filter 5.2.3 Band Pass Filter 5.2.4 Band Stop Filter. 5.3 Definitions of Terms: Cut-off frequency, Pass band, Stop band, Center frequency, Roll off rate, BW, Q- factor 5.4 Circuit diagram, frequency response and simple numerical of: 5.4.1 First order Butterworth Low Pass Filter 5.4.2 First order Butterworth High Pass Filter 5.4.3 Band Pass Filter (Wide band pass and Narrow band pass) 5.4.4 Band Reject Filter (Wide band reject and Narrow band reject) **Course Outcome: CO2 Teaching Hours: 8 hrs. Marks:14 (R-02, U-06, A-06)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Operational Amplifier (OP AMP)	06	06	--	12
2	Op-Amp Circuits	04	06	04	14
3	Comparators and Detectors	02	04	04	10
4	Timers and Phase Locked Loops	02	04	04	10
5	Active Filters using Op-Amp's	02	06	06	14
Total		**16**	**26**	**18**	**60**

List of experiments: Total 12 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	**1**	**CO1**	Measure parameters of IC 741 (i/p offset voltage, CMRR).	**4**
2	**2**	**CO2**	Calculate gain of inverting & non inverting amplifier using OPAMP for DC input.	**4**
3	**4**	**CO3**	Observe the output waveform of AMV using IC 555 and calculate Ton, Toff, % duty cycle and output oscillation frequency.	**4**
4	**5**	**CO2**	Plot frequency response of first order Butterworth low pass filter.	**4**
5	**2**	**CO2**	Calculate output of adder (2 i/p) & subtractor using OPAMP.	**4**
6	**2**	**CO2**	Calculate gain and observe output waveform of inverting & non inverting amplifier using OPAMP for Sine wave i/p.	**4**
7	**2**	**CO2**	Observer the o/p waveform of active Integrator for sine & square input using OPAMP.	**4**
8	**2**	**CO2**	Observer the o/p waveform of active Differentiator for sine & square input using OPAMP.	**4**
9	**2**	**CO2**	Calculate output of V to I converter and I to V converter using OPAMP.	**4**
10	**3**	**CO4**	Observe the output of Instrumentation amplifier using 3 OPAMP and verify its o/p.	**4**
11	**3**	**CO4**	Observer the o/p waveform of inverting and non-inverting Zero Crossing Detector. Observer the o/p waveform of Schmitt Trigger using OPAMP.	**4**
12	**4**	**CO3**	Observe the output waveform of Monostable multivibrator using IC 555 and calculate time period of pulse width. Observe the output waveform of Bistable multivibrator using IC 555.	**4**
13	**5**	**CO2**	Plot frequency response of first order Butterworth high pass filter.	**4**
14	**All**	**CO1 CO2 CO3 CO4**	Mini Project: Develop any one application using IC μA741 / IC LM 324 / IC 555 / IC 556 / any topic suggested by faculty.	**4**
15	**All**	**CO1 CO2 CO3 CO4**	Case Study on: Circuit diagram, working principle and output waveform of oscillator using IC 741(eg. AMV, MMV, BMV) / any topic suggested by faculty.	**4**
		Total		**60**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Integrated circuits	K.R.Botkar, Khanna Publisher , New Dehli	9788174092083
2	Op-Amp and linear integrated circuits	Ramakant A. Gaikwad , Prentice-Hall of India	9788120320581
3	Design with Op-Amp and analog integrated circuits	Sergio Franco, Tata McGraw-Hill New Delhi	9780078028168
4	Linear integrated circuits	Roy Choudhari, Sail B; New Age International Publisher	8122414702

E-References:

1. **Opamp Basics: http://www.khanacademy.org/science/electrocal-engineering/ee-amplifiers**
2. **Opamp Basics: http://www.jamia-physics.net/lecnotes/lab/opamp.pdf**
3. **IC555s: http://www.jamia-physics.net/lecnotes/lab/555.pdf**
4. **Video lecture opamp: http:/freefreevideolectures.com/course/3062/Electronics-1/37**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	-	1	1-	1	1	1	3	1	-
CO2	2	3	3	3	1	2	1	3	3	2
CO3	2	1	3	3	1	2	1	3	3	2
CO4	2	2	3	3	1	2	2	3	3	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Gavand Uttam	Dy. Manager	JSW Steel, Dolvi, Pen, Raigad
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I/C, Curriculum Development Cell

Principal


GOVERNMENT POLYTECHNIC MUMBAI
GPM
ESTD. 1960
MAKING KNOWLEDGE TO WORK

Programme : **Diploma in CE/EE/EC/CO/IT/IS/LG/LT (Sandwich pattern)**										
Course Code: **HU19102**				Course Title: **Environmental Studies**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	**02**	**--**	**02**	**--**	**--**	**--**	**--**	**25**	**25**	**50**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Technicians working in industries or elsewhere essentially require the knowledge of environmental Studies so as to enable them to work and produce most efficient, economical and eco-friendly finished products. Solve various engineering problems applying ecosystem to produce eco – friendly products. Use relevant air and noise control method to solve domestic and industrial problems. Use relevant water and soil control method to solve domestic and industrial problems. To recognize relevant energy sources required for domestic and industrial problems. Solve local solid and e-waste problems.

Course Outcomes: Student should be able to

CO1	Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
CO2	Understand the suitable air, extent of noise pollution, and control measures and acts.
CO3	Understand the water and soil pollution, and control measures and acts.
CO4	Understand different renewable energy resources and efficient process of harvesting.
CO5	Understand Solid Waste Management & E Waste Management, ISO 14000, 45001 & Environmental Management.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Ecosystem** 1.1 Structure of ecosystem, biotic & Abiotic components 1.2 Food chain and food web 1.3 Aquatic (Lentic and Lotic) and terrestrial ecosystem 1.4 Carbon, Nitrogen, Sulphur, Phosphorus cycle 1.5 Global warming -Causes, effects, process, Green House Effect, Ozone depletion **Course Outcome: CO1 Teaching Hours : 6 hrs Marks: 03 (R- NA, U-NA, A- NA)**
2	**Air and Noise Pollution** 2.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 2.2 Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone

	separator, Electrostatic Precipitator) 2.3 Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler 2.4 Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution **Course Outcome: CO2 Teaching Hours : 6 hrs Marks: 05 (R- NA, U-NA, A- NA)**
3	**Water and Soil Pollution** 3.1 Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition 3.2 Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis) 3.3 Causes, Effects and Preventive measures of Soil Pollution : Causes – Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-waste 3.4 Mangroves : Importance, benefits. **Course Outcome:CO3 Teaching Hours : 6 hrs Marks: 05 (R- NA, U-NA, A- NA)**
4	**Renewable sources of Energy** 4.1 Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. 4.2 Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas 4.3 Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy 4.4 New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion) Concept, origin and power plants of geothermal energy **Course Outcome:CO4 Teaching Hours : 6 hrs Marks:05 (R- NA, U-NA, A- NA)**
5	**Solid Waste Management OR E- Waste Management, ISO 14000 & Environmental Management** **For Civil Engineering :** 5.1 Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, biomedical waste. 5.2 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste 5.3 Air quality act 2004, air pollution control act 1981 and water pollution and control act1996. Structure and role of Central and state pollution control board. 5.4 Concept of Carbon Credit, Carbon Footprint. 5.5 Environmental management in fabrication industry. 5.6 ISO14000: Implementation in industries, Benefits, ISO 45001:2018 5.7 Role of MPCB in factory permit. 5.8 Green pro IGBC certification, its benefits **OR** **For Computer Engineering & Information Technology :** 5.1 E-Waste Electronic products which have become unwanted, non-working, obsolete 5.2 E-Waste Management Services 5.3 Separation of E-Waste from other waste

	5.4 Categorization of E-Waste into old working equipments, old computers, non-working components 5.5 Authorized Recycling Facilities 5.6 Refurbishing **OR** **For Electrical Engineering :** 5.1 Various e-waste sources, their constituents, and health impacts 5.2 e-Waste Problem in India 5.3 Initiatives on building awareness in e-waste management. 5.4 Current Status of e-Waste Management & Environmental (Protection) Act 1986 5.5 Development of waste recycling technologies. 5.6 Opportunities of e-Waste Management in India 5.7 e-Waste Management techniques **OR** **For Electronics Engineering & Instrumentation Engineering :** 5.1 Solid waste generation- Sources and characteristics of : E- waste, biomedical waste. 5.2 Toxicity due to hazardous substances in E waste and their impact 5.3 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste 5.4 Domestic E waste disposal and E waste management 5.5 Air quality act 2004, air pollution control act 1981 and water pollution and control act1996. Structure and role of Central and state pollution control board. 5.6 Concept of Carbon Credit, Carbon Footprint. **OR** **For Leather Technology/ Leather Goods & Footware Technology :** 5.1 Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, biomedical waste. 5.2 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste 5.3 Air quality act 2004, air pollution control act 1981 and water pollution and control act1996. Structure and role of Central and state pollution control board. 5.4 Concept of Carbon Credit, Carbon Footprint. 5.5 Environmental management in fabrication industry. 5.6 ISO14000: Implementation in industries, Benefits. 5.7 Solid waste management in leather and footwear industries **Course Outcome:CO5 Teaching Hours : 6 hrs Marks:07(R- NA, U-NA, A- NA)**

Note : Chapter 5 should be teach as per department mentioned.

List of tutorials:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,2,3, 4,5	CO1,CO2, CO3,CO4, CO5	Prepare a write up on each unit (altogether 5 in number) that summarizes the whole unit and presents important points on it.	14
2	2,3	CO2,CO3	Visit to a local polluted site : Urban/Rural/Industrial/Agricultural and prepare a report	4

			based on visit.	
3	4	CO4	Visit to biomass plant and prepare a report based on visit.	6
4	5	CO5	Visit to municipal solid waste management organization **or** an authorized e-waste recycling plant and prepare a report based on visit.	6
Total				**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Environmental Studies	S.C. Sharma & M.P. Poonia Khanna Publishing House, New Delhi	ISBN: 978-93-86173-09-6
2	Understanding Chemistry	C.N.Rao Universities Press(India) Pvt. Ltd. 2011	ISBN:13-9788173712500
3	Waste water treatment for pollution control and reuse	Arceivala, Soli Asolekar, Shyam Mc-Graw Hill Education India Pvt. Ltd. New york, 2007	ISBN:978-07-062099
4	Elements of Environmental Pollution control	O.P.Gupta Khanna Publishing House, New Delhi	ISBN:13-9789382609667

E-References:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com
9) http://www.nationallibrary.gov.in

CO Vs PO and CO Vs PSO Mapping (Civil Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	1
CO2	3	3	2	2	3	3	3	--	1	1
CO3	3	3	2	2	3	3	3	--	1	1
CO4	3	3	2	2	3	3	3	--	1	1
CO5	3	3	2	2	3	3	3	--	1	1

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	3
CO2	3	3	2	2	3	3	3	--	--	2
CO3	3	3	2	2	3	3	3	--	--	2
CO4	3	3	2	2	3	3	3	--	--	2
CO5	3	3	2	2	3	3	3	--	--	2

CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	2
CO2	3	3	2	2	3	3	3	--	--	--
CO3	3	3	2	2	3	3	3	--	--	--
CO4	3	3	2	2	3	3	3	--	--	2
CO5	3	3	2	2	3	3	3	--	--	1

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	2	1	3	3	3	--	--
CO2	3	3	2	2	3	3	3	--	--
CO3	3	3	2	2	3	3	3	--	--
CO4	3	3	2	2	3	3	3	--	--
CO5	3	3	2	2	3	3	3	--	--

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	--
CO2	3	3	2	2	3	3	3	--	--	--
CO3	3	3	2	2	3	3	3	--	--	--
CO4	3	3	2	2	3	3	3	--	--	--
CO5	3	3	2	2	3	3	3	--	--	--

CO Vs PO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	3	--
CO2	3	3	2	2	3	3	3	--	2	--
CO3	3	3	2	2	3	3	3	--	2	--
CO4	3	3	2	2	3	3	3	--	2	--
CO5	3	3	2	2	3	3	3	--	3	--

CO Vs PO and CO Vs PSO Mapping (Leather Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	1
CO2	3	3	2	2	3	3	3	--	--	--
CO3	3	3	2	2	3	3	3	--	--	--
CO4	3	3	2	2	3	3	3	--	--	--
CO5	3	3	2	2	3	3	3	--	--	--

CO Vs PO and CO Vs PSO Mapping (Leather Goods & Footware Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3	--	--	1
CO2	3	3	2	2	3	3	3	--	--	--
CO3	3	3	2	2	3	3	3	--	--	--
CO4	3	3	2	2	3	3	3	--	--	--
CO5	3	3	2	2	3	3	3	--	--	--

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. S. M. Male	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(Fourth Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - IV**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19403	Control Systems	4	2	0	6	6	60	20	20	0	50	50	200
EC19303	Power Electronics	4	4	0	8	8	60	20	20	50*	0	25	175
MG19501	EDP And Management	3	0	0	3	3	60@	20@	20@	0	0	0	100
SC19112	Applied Mathematics	1	0	2	3	3	0	0	0	0	0	50	50
EC19404	Computer Network	3	2	0	5	5	0	0	0	0	50	50	100
EC19405	Elective1 Fiber optic Communication	4	2	0	6	6	60	20	20	50*	0	25	175
EC19406	Elective 1 Mobile Communication												
EC19407	PYTHON 3.4.3 (MOOC)	**0**	4	0	4	4	0	0	0	0	0	0	0
	Total	**19**	**14**	**2**	**35**	**35**	**240**	**80**	**80**	**100**	**100**	**200**	**800**
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
Curriculum Development,
Department of Electronic

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19403**				Course Title: **Control System**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30mins)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**-**	**50**	**50**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) * Indicates assessment by External Examiner else internal practical skill test # indicates Self, on- line learning Mode, @ indicates on line examination.

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

A control system consists of several elements or components connected and operated in such a way as to achieve a desired control in a specific domain of operation of the system. To increase the effectiveness, efficiency and quality of products, now a days it is very much essential to complete the required work or task automatically in every field. Control systems are also used in space technology and defense applications such as nuclear power weapons, guided missiles etc. As the control system is the basis of various automatic control systems, therefore the students of electronic engineering must have the knowledge of control system.

Course Outcomes: Student should be able to

CO1	Identify various types of control systems.
CO2	Understand time and frequency domain specifications
CO3	Determine stability conditions of control system.
CO4	Select appropriate Control system component and control action as necessary.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Overview of Control system** 1.1 System – definition and practical examples Control system – definition and Examples. 1.2 Classification of control system.

	1.3 Open loop and closed loop systems – definition, block diagram, practical example and Comparison. 1.4 Transfer function – definition, derivation of transfer function for close loop control system. Transfer function of simple RC and RLC circuits. 1.5 S-plane representation: 1.6 Poles and zeros: Definition and simple numerical 1.7 Order of a system – definition, 0^{th}, 1^{st}, 2^{nd} order system standard equation, practical examples. 1.8 Linear time varying and time in varying systems –definition and example. 1.9 Block diagram representation of a system-Reduction rules, problems (only SISO). **Course Outcome: CO1 Teaching Hours:12 hrs Marks: 10 (R-04, U-04, A-02)**
2	**Time Domain Analysis** 2.1 Standard test inputs: Step, ramp, parabolic and impulse, significance, and corresponding Laplace representation. 2.2 Time domain analysis: Transient and steady state response. 2.3 First order control system: Analysis for unit step input, Concept of time constant. 2.4 Second order control system: Analysis for unit step input, Concept, definition and effect of damping. 2.5 Time response specifications (no derivations) Tp, Ts, Tr, Td, Mp. Simple numerical on time response specifications. 2.6 Steady state analysis: Type 0, 1, 2 systems, 2.6.1 Error constants 2.6.2 Steady state error 2.6.3 Simple numerical **Course Outcome:CO2 Teaching Hours:12 hrs Marks: 14 (R-04, U-04, A-06)**
3	**Frequency domain Analysis** 3.1 Introduction, advantages and disadvantages of frequency response analysis and frequency domain 3.2 Frequency response specifications. 3.3 Correlation between time and frequency domain specifications. 3.4 Realization of Lead, Lag, Lead-Lag Compensator. **Course Outcome: CO2 Teaching Hours: 06 hrs Marks: 08 (R-02, U-06, A-0)**
4	**Stability** 4.1 S-plane – Introduction. 4.2 Definition of stability 4.3 Necessary Conditions for stability. 4.4 Types of stability- stable, unstable, critically stable and conditionally stable system, relative stability. 4.5 Routh's stability criterion- different cases and conditions and simple numerical 4.6 Bode plot - introduction, Definition of Phase Margin and Gain Margin. 4.7 Introduction of Root Locus (No Numerical)

	Course Outcome: CO3 Teaching Hours:12 hrs Marks: 10 (R- 02, U-04, A-04)
5	**Servo Systems** 5.1 Servo system – definition, block diagram. 5.2 Servo components: 5.2.1 Potentiometer as error detector. 5.2.2 Synchro as Transmitter and Error detector. 5.2.3 Rotary encoder. 5.3 Armature controlled DC servo motor. 5.4 Field controlled DC servo motor. **Course Outcome: CO4 Teaching Hours: 8 hrs Marks:08 (R-02, U-04, A-02)**
6	**Control Actions:** 6.1. Process control system: Block diagram and explanation of each block. 6.2. Control actions 6.2.1 Discontinuous modes: ON OFF controllers: equation, neutral zone 6.2.2 Continuous modes: PROPORTIONAL controllers (offset, Proportional Band), INTEGRAL and DERIVATIVE controllers; o/p equations, corresponding Laplace Transforms, Response of P, I and D controllers. 6.3 Composite controllers: PI, PD, PID controllers- Block diagram, O/P Equations, Response, Comparison. 6.4 Electronic P, I, D, PI, PD, PID controller: only circuit diagram using OPAMP **Course Outcome: CO4 Teaching Hours: 10 hrs Marks:10 (R-02, U-04, A-04)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Overview of Control system**	04	04	02	10
2	**Time Domain Analysis**	04	04	06	14
3	**Frequency domain Analysis**	02	06	--	08
4	**Stability**	02	04	04	10
5	**Servo Systems**	02	04	02	08
6	**Control Actions**	02	04	04	10
	Total	**16**	**26**	**18**	**60**

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	Demonstrate the performance of open loop control system using electronic amplifiers- Op Amps.	2
2	1	CO1	Demonstrate the performance of closed loop control system using electronic amplifiers- Op Amps.	2
3	2	CO2	Plot unit step response of given first-order system and find out its time constant.	2
4	3, 6	CO3, CO4	A case study on – Determine Stability of given control system using Rouths Criteria / Case study on: Demonstration of PID controller for temperature/level control using any software / any topic suggested by faculty. (Actual work on case study etc.)	2
5	3, 6	CO3, CO4	A case study on – Determine Stability of given control system using Rouths Criteria / Case study on: Demonstration of PID controller for temperature/level control using any software / any topic suggested by faculty. (Case study report writing etc)	2
6	5	CO4	Measurement of error using Potentiometer error detector.	2
7	1	CO1	Determine the transfer function for given closed loop system in block diagram representation.	2
8	2	CO2	Plot unit step response of given second-order system.	2
9	2	CO2	Determine the steady-state errors for Type-0,1 and 2 systems for different standard inputs.	2
10	3	CO2	Plot the Phase margin and Gain Margin of a given system Using Bode Plot.	2
11	5	CO4	Demonstration of Synchro transmitter receiver system.	2
12	6	CO4	Demonstration of temperature/level control with ON-OFF controller.	2
13	6	CO4	Demonstration of temperature/level control with PI controller.	2
14	2	CO2	Mini Project: Simulate and test the performance of 1st order RC and 2^{nd} order RLC circuit using any simulation software / any topic suggested by faculty. (execute actual project with the help of software etc)	2
15	2	CO2	Mini Project: Simulate and test the performance of 1st order RC and 2^{nd} order RLC circuit using any simulation software / any topic suggested by faculty. (mini project report preparation etc)	2
		Total		30

Note: Experiments No. 1 to 6, 14 and 15 are compulsory and should map all units and Cos.
Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Control system Engg.	J.J.Nagrath & M. Gopal,Tata McGraw-Hill	9781848290037
2	Process Control Instrumentation Technology	C.D. Johnson, PHI	9789332549456
3	Modern control Engg.	K. Ogata ,PHI	978812034010
4	Control systems	A. Kumar,Tata McGraw-Hill	9788120331976
5	Principles of Control systems	Goyal and Bakshi,Technical Publication	9788189411596

E-Reference

1.www.nptlvideos.com/control_sysrtems

2.www.in.mathworks.com/solutions/control_system.html?s_tid=srchtitle

3. All : https://www.youtube.com/watch?v=o_Bp7j77Uqc&list=PLWPirh4EWFpGpH_Rb6Q4iQ6vGGRA6MORZ&index=2

4. All: https://www.youtube.com/playlist?list=PLgwJf8NK-2e43et6qbo4IqYSJCv-6kN90

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	--	--	2	1	2	--
CO2	2	2	2	1	--	2	3	2	3	2
CO3	3	3	3	2	1	2	3	3	2	3
CO4	2	3	3	2	1	3	3	3	1	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Gavand Uttam	Dy. Manager	JSW Dolvi, Pen, Raigad
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Coordinator,
Curriculum Development,
Department of Electronics Engineering

Head of Department
Department of Electronics Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19303**				Course Title: **Power Electronics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**4**	**-**	**8**	**60**	**20**	**20**	**50***	**-**	**25**	**175**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

It is necessary for the students to study and apply the basic principles, analyse and troubleshoot simple circuits like controlled rectifier, light dimmer, battery charger etc. To acquire this level of understanding, the basic knowledge of power semiconductor devices and circuit is essential. This Course is one of the core subject which is deals with construction, working principle, application of power semiconductor devices as well as it deals with some sophisticated power electronics systems and complex circuits such as choppers, inverters etc.

Course Outcomes: Student should be able to

CO1	Identify power electronics devices in circuits.
CO2	Maintain turn ON and turn OFF circuit and protection circuit of SCR
CO3	Understand the concept of single phase and three phase controlled rectifier.
CO4	Use choppers and inverters in different application
CO5	Identify and select appropriate thyristor and related devices for various Industrial Electronics applications.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Power Semiconductor devices:** 1.1 SCR introduction 1.1.1 Construction, symbol, working principle and V-I characteristics. 1.1.2 Transistorized equivalent circuit of SCR. 1.1.3 Specifications of SCR. 1.1.4 Definitions: Holding current, latching current, firing angles, conduction angle and break over voltage. 1.1.5 Applications of SCR

	1.2 Thyristor Family Devices: Construction, symbol, working principle, V-I characteristics and application 1.2.1 TRIAC 1.2.2 Power MOSFET 1.2.3 IGBT 1.3 Triggering Devices: Construction, symbol, working principle, V-I characteristics and application. 1.3.1 DIAC 1.3.2 UJT **Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)**
2	**SCR Turn ON, Protection circuits and SCR Turn OFF methods** 2.1 SCR turn on methods. 2.2 Gate trigger circuits: Circuit diagram, working principle, waveforms. 2.2.1 Resistance triggering circuit 2.2.2 R-C triggering circuit 2.2.3 UJT triggering using pulse transformer 2.3 Series and parallel connection of SCRs 2.3.1 Need for equalizing network 2.3.2 AC and DC equalizing circuits 2.3.3 Definition of String efficiency, Derating. 2.4 Protection circuits: Circuit diagram, working principle. 2.4.1 over voltage 2.4.2 over current 2.4.3 dv/dt protection 2.4.4 di/dt protection 2.5 Natural commutation: circuit diagram & working principle 2.6 Forced commutation: circuit diagram & working principle. 2.6.1 Type A 2.6.2 Type B 2.6.3 Type C 2.6.4 Type D 2.6.5 Type E **Course Outcome: CO2 Teaching Hours : 13 hrs Marks: 12 (R-6, U-6, A-2)**
3	**Controlled Rectifier** 3.1 Single-phase half wave controlled rectifiers with resistive load, inductive load (with and without freewheeling diode): Circuit diagram, working principle, waveforms. 3.2 Single-phase full wave (bridge configurations) controlled rectifiers with resistive load and inductive load (with and without freewheeling diode): Circuit diagram, working principle, waveforms. 3.2.1 Effect of freewheeling diodes 3.3 Three-phase half wave controlled rectifier with resistive load: Circuit diagram, working principle, waveforms

	Course Outcome: CO3 Teaching Hours : 8 hrs Marks: 8 (R-2, U-4, A-2)
4	**Chopper** 4.1 Introduction, classification, basic chopper circuit diagram and working. 4.2 Types of chopper: Circuit diagram, working principle and waveforms 4.2.1 Step up chopper (Boost converter) using SCR. 4.2.2 Step down chopper (Buck converter) using SCR. 4.2.3 First quadrant or class A chopper. 4.2.4 Second quadrant or class B chopper. 4.2.5 Two quadrant Type A or class C chopper. 4.2.6 Two quadrant Type B or class D chopper. 4.2.7 Four quadrant chopper or class E chopper. 4.3 Other chopper circuit : circuit diagram and working principle 4.3.1 Buck-Boost converter using MOSFET. **Course Outcome: CO4 Teaching Hours : 9 hrs Marks: 10 (R- 4 , U- 4 , A-2)**
5	**Inverter** 5.1 Introduction. Classification of inverters according to nature of input source, method of commutation, connection of thyristor and commutating component. 5.2 Types of inverters: Working principle and operation 5.2.1 Series inverter 5.2.2 Parallel inverter 5.3 Single phase SCR bridge Inverter : Circuit diagram , working principle and waveforms 5.3.1 1Ø half bridge inverter 5.3.2 1Ø Full bridge inverter 5.4 McMurray Bedford half Bridge Inverter: Circuit diagram, working principle and waveforms. 5.5 Applications. **Course Outcome: CO4 Teaching Hours : 8 hrs Marks: 8 (R- 2, U- 4, A-2)**
6	**Industrial applications of Power Electronic devices** 6.1 Switched Mode power Supply (SMPS): Classification, Basic SMPS block diagram and working. 6.1.1 Working of Modified block diagram of SMPS 6.1.2 Advantages and Disadvantages of SMPS 6.2 Uninterruptible Power Supply (UPS): Need and block diagram of UPS system. 6.3 Types of UPS system: Block diagram and operation 6.3.1 On-line UPS 6.3.2 Off-line UPS 6.3.3 Line interactive UPS 6.4 Industrial Circuits: Circuit diagram and working principle 6.4.1 Light dimmer using TRIAC 6.4.2 Battery charger using SCR

	6.4.3 Emergency Lighting System 6.5 Speed control of DC motor: Circuit diagram and working principle 6.5.1 Field flux control 6.5.2 Armature Voltage control 6.6 Speed control of Induction motor: Circuit diagram and working principle 6.6.1 Variable frequency control **Course Outcome: CO5 Teaching Hours : 12 hrs Marks: 12 (R-4, U-8, A-)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Power Semiconductor devices**	4	4	2	10
2	**SCR Turn ON, Protection circuits and SCR Turn OFF methods**	4	6	2	12
3	**Controlled Rectifier**	2	4	2	8
4	**Chopper**	4	4	2	10
5	**Inverter**	2	4	2	8
6	**Industrial applications of Power Electronic devices**	4	8	0	12
	Total	**20**	**30**	**10**	**60**

List of experiments: Total 12 experiments out of 15 experiments

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	A. Verify the V-I characteristics of SCR. B. Verify the V-I characteristic of TRIAC	4
2	2	CO2	Observe firing angle control of SCR using R triggering method.	4
3	3	CO3	Observe the waveform of half wave controlled rectifier for variable firing angle.	4
4	4	CO4	Test waveforms at various points of step up chopper using SCR	4
5	6	CO5	Test light dimmer circuit using TRIAC	4
6	5	CO4	Trace the series inverter circuit and list the major components of the circuit, sketch the observed waveforms and measure voltage levels.	4
7	1	CO1	A. Verify the V-I characteristic of power MOSFET. B. Verify the V-I characteristic of DIAC.	4

8	2	CO2	Observe firing angle control of SCR using RC triggering method.	4
9	3	CO3	Observe the waveform of full wave controlled rectifier for variable firing angle	4
10	4	CO4	Test waveforms at various points of step down chopper using SCR	4
11	5	CO4	Trace the parallel inverter circuit and list the major components of the circuit, sketch the observed waveforms and measure voltage levels.	4
12	6	CO5	Test Battery charger circuit using SCR	4
13	2	CO2	Observe the output waveforms of relaxation oscillator using UJT	4
14	2	CO2	Case study on protection circuit of SCR	4
15	1,2,3 ,4,5, 6	CO1,2 ,3,4,5	Mini project: Group of two students should prepare PCB with tested circuit mounted on it for any Industrial electronics application circuit. For example. SCR flasher, Emergency lighting system and/or any circuit from practical list.	4
Total				**60**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Power electronics	M. D. Singh & K.B. khanchandani, Mcgraw-hill publishing, 2nd edition 1998	978-0070583894
2	Industrial & power electronics	Harish rai, umesh publication, 1/e edition 2018	978-9386827869
3	Power electronics	P. S. Bimbhra, Khanna publishers; 5th edition 1990	978-8174092793
4	Power electronics	Munammad h. Rashid, Pearson Education., 3nd edition , 2014	978-9332535770

E-References:

1. https://ndl.iitkgp.ac.in/
2. www.scribd.com
3. https://nptel.ac.in/courses/
4. www.youtube.com

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	3		1	1	2	1	1
CO2	2	1	1	1	1	1	1	2	2	1

CO3	2	1	2	1	1	1	2	2	2	1
CO4	1	1	2	3	2	2	1	2	2	2
CO5	3	3	3	3	3	2	2	3	3	2

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3	Ms. A. A. Sangale	Lecturer	Govt. Polytechnic Awasari
4	Mrs. A. M. Ghadge (Curriculum Content Designer)	Lecturer	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: MG19501				Course Title: **Entrepreneurship Development And Management**						
Compulsory / Optional: compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (1Hrs)	TS1 (30 min)	TS2 (30 min)	PR	OR	TW	Total
3	**-**	**-**	**3**	**60@**	**20@**	**20@**	**-**	-	**-**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale: Diploma pass out students are normally placed at the supervisory level when they go to industries. Where they are expected to handle labour, material and machinery to get the targeted output. This requires knowledge of managing different resources of the organizations effectively. Entrepreneur puts up new projects that create wealth and opens up many employment opportunities. This course deals with different aspects of management, which helps technician to manage the changed environment in the industry.

Course Outcomes: Student should be able to

CO1	Understand the basic concept of entrepreneurial process , scope and various support systems to entrepreneur.
CO2	Understand the different levels and process of management.
CO3	Describe forms of ownership, Human Resource Management and industrial safety rules.
CO4	Manage different industrial resources efficiently.
CO5	Apply various rules and regulations concerned with Business.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Entrepreneurship** 1.1. Definition of entrepreneurship 1.2. Characteristics of entrepreneurship 1.3. Functions of entrepreneurship 1.4. Barriers of entrepreneurship 1.5. Distinction of entrepreneur and Manager **Course Outcome: CO1 Teaching Hours : 5 Marks: 8 (R- 4 U-4, A- -)**
2	**Scope and Support Systems** 2.1. Trading, Consultancy, Franchises, Service Sectors, Emerging Areas 2.2 Small Enterprises 2.2.1. Definition, Characteristics & Types 2.2.2. Problems Faced by SSI

	2.2.3. Industrial Sickness- Causes & Corrective Measures 2.3. Functions & Supportive Institutes (MSME, SIDBI, DICS, SSIB, NSIC, MITCON, TCO's, MIDC) 2.4. Government Agencies **Course Outcome: CO1 Teaching Hours : 6 Marks: 8 (R-2 , U- 2 , A- 4)**
3	**Overview Of Business Management Process** 3.1 Definition of Business, 3.2 Types of Business- Service, Manufacturing & Trades 3.3 Management- Various Definitions 3.4. Levels of Management 3.5. Basic Functions of Management- Planning, Organizing, Staffing, Directing & Controlling 3.6. Fourteen Principles of Management **Course Outcome: CO2 Teaching Hours : 6 Marks: 10 (R- 2 , U- 6 , A-2)**
4	**Organizational and HR Management** 4.1. Organization- Definition 4.2 Forms of Ownership, Proprietorship, Partnership, Joint Stock Company, Co-Operative Society, Government Sector 4.3 Personnel Management- Definition & Functions. 4.4 Financial Management : Objective, functions, Capital generation: Types and Source of capital **Course Outcome: CO3 Teaching Hours : 6 Marks: 10 (R- 2 , U- 8 , A- 0)**
5	**Industrial Safety and Management** 5.1. Causes of Accident 5.2. Safety Precautions 5.3. Introduction To: 5.3.1. Factory Act 1948 5.3.2. Workmen Compensation Act 5.3.3. Goods And Services Tax **Course Outcome: CO3 Teaching Hours : 6 Marks: 8 (R- 2 , U- 4, A- 2)**
6	**Materials Management** 6.1. Inventory Management: Definition of Inventory and inventory Control. Objectives of Inventory Control 6.2. ABC Analysis, Graphical Representation 6.3. Economic Order Quantity (E.O.Q.) 6.3.1. Graphical Representation 6.3.2 Calculation of E,O.Q. **Course Outcome: CO4 Teaching Hours : 7 Marks: 6 (R- - , U-4 , A- 2)**
7	**Project Management** 7.1. Project Management: Definition And Meaning of Project 7.2 Overview of Project Management Methodologies viz. Water Fall, Agile, Hybrid, Critical Path Method, Critical Chain Method, Integrated Project Management, PRISM, PRINCE - 2 7.3. Introduction to C.P.M & P.E.R.T, Preparation Of Network, Calculation of Project Duration And Floats 7.4. Concept oF Break Even Analysis 7.5. Project Risk and Quality Management: Qualitative and Quantitative Analysis of Risks and Quality, Risk Index Risk Management, Quality Management. 7.6 Concept of KAIZEN, 5 "S". 7.7 Advantages and Applications of KAIZEN, 5 "S". **Course Outcome: CO5 Teaching Hours : 9 Marks: 10 (R- 2 , U-4 , A-4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction to entrepreneurship**	4	4	-	8
2	**Scope and Support Systems**	2	2	4	8
3	**Overview Of Business Management Process**	2	6	2	10
4	**Organizational and HR Management**	2	8	0	10
5	**Industrial Safety and Management**	2	4	2	8
6	**Materials Management**	-	4	2	6
7	**Project Management**	2	4	4	10
	Total	**14**	**32**	**14**	**60**

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References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Industrial Engineering and Management	Dr .O.P. Khanna , Dhanpal Rai & Sons., New Delhi	ISBN: 9788189928353, 9788189928353
2	Industrial Management	Rustom S. Davar, Khanna publication	0800212436, 9780800212438
3	Industrial Management	Jhamb & Bokil , Everest Publication ,Pune.	8176602043 978-8176602044
4	Organization & Management	R. D .Agarwal , Tata M'graw hill	0-07-451596-3

E-References:

1. https://ndl.iitkgp.ac.in/ 2.www. scribd.com
3. www.slideshare.net.com

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	1	-	1	2	2	1	-	-
CO2	2	2	1	-	2	2	2	1	-	-
CO3	3	3	2	2	1	2	2	1	-	-
CO4	1	2	1	-	1	2	2	1	-	-
CO5	2	3	2	1	2	3	2	1	-	-

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **SC19112**				Course Title: **APPLIED MATHEMATICS**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 Min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
1	**--**	**2**	**3**				**--**	---	**50**	**50**

Abbreviations: TH- Theory; PR-Practical; TU-Tutorial; TS1 and TS2- Term Tests; OR-Oral Exam; TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal assessment

Note: For Minimum passing marks under various heads, refer, examination rule AR26.

Rationale:

This subject is classified under the foundation courses group and proceeds further to application level of mathematics to teach students the theory,concepts ,principles of applied mathematics and the application, importance and use of mathematics in the analysis of concepts in electronics.

Course Outcomes: Student should be able to

CO1	Solve first order first degree differential equations of various types
CO2	Apply differential equation for solving problems in electronics engineering field.
CO3	Apply laplace transform to solve differential equation of first order with constant coefficients

Course Content Details:

Unit No	Topics / Sub-topics
1	**1.Differential Equations** 1.1 Definition of Differential Equation 1.2 Order and Degree of Differential Equation 1.3 Formation of Differential equation for function containing single constant 1.4 Solution of first order first degree differential equation 1.4.1 Variable separable

	1.4.2 Equation reducible to variable separable form 1.4.3 Homogeneous D.E. 1.4.4 Exact D.E. 1.4.5 linear D.E. **Course Outcome: CO1 Teaching Hours : 06 hrs Marks : 20 (R- 8, U-6, A-6)**
2	**2.Application of Differential equation** 2.1 For solution of simple geometrical cases. 2.2 For solution of simple electrical/electronic circuits: LC ,RC, RLC. **Course Outcome: CO2 Teaching Hours : 03 hrs Marks: 10 (R- 4 , U-2 , A-4)**
3	**3. Laplace Transformation** 3.1 Definition 3.2 Laplace transform of elementary functions 3.3 Important properties of Laplace Transform 3.3.1 Linearity property 3.3.2 First shifting property 3.3.3 Second shifting property 3.3.4.change of scale property 3.4 Important results-multiplication by t^n and division by t (without proof) 3.5 Inverse Laplace Transform 3.6 Properties of Inverse Laplace transform 3.6.1 Linearity Property 3.6.2 First shifting Property 3.7 Inverse laplace transform by partial fraction 3.8 Application of laplace transform for solving differential equations of first order with costant coefficients **Course Outcome: CO3 Teaching Hours : 06 hrs Marks: 20 (R-8 , U- 6 , A-6)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Differential Equations**	8	6	6	20
2	**Application of Differential equation**	4	2	4	10
3	**Laplace Transformation**	8	6	6	20
	Total	**20**	**14**	**16**	**50**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Engineering Mathematics	Ravish R Singh,Mukul Bhatt McGraw Hill	13-9780070146150 10-0070146150
2	Mathematics for Polytechnic Students (Volume I)	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

E-References:

1. www.math-magic.com
2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2			1				1	1
CO2	3	2			1				1	1
CO3	3	1			1				1	1

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Coordinator, Curriculum Development, Department of Sci. & Humanities

Head of Departments Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19404**				Course Title: **Computer Network**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**2**	**-**	**5**	**-**	**-**	**-**	**-**	**50**	**50**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

This course introduces students to communication networks and concentrates on building a firm foundation of it. Students will study data communication concepts and techniques in layered network architecture (OSI reference model, TCP/IP networking architecture).

This course provides the fundamental knowledge of the various aspects of computer networking.

Course Outcomes: Student should be able to

CO1	Classify the different network types
CO2	Identify the different types of network topologies and protocols
CO3	Enumerate the layers of the OSI/ISO model
CO4	Illustrate different multiplexing and switching techniques
CO5	Demonstrate the functions of different network components and devices

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Networks:** 1.1 Brief history: Voice networks to data networks 1.2 Definition of network, Need of data communication Network 1.3 Network Architecture: Workstation, Host, Client, Server 1.4 Basic Network Types: Classification according to area 1.4.1 Local Area Network (LAN) 1.4.2 Wireless LAN (WLAN) 1.4.3 Wide Area Networks (WANs) 1.4.4 Variants (CANs, MANs and PANs) 1.4.5 VPN, MAN, Peer to peer, Client/server 1.5 Networks, Sub networks and Inter-networks

	1.6 The Internet, Intranets and Extra-nets **Course Outcome: CO1 Teaching Hours: 09**
2	**Introduction to Transmission Technologies:** 2.1 Network Physical Topologies: 2.1.1 Bus 2.1.2 Star 2.1.3 Ring 2.1.4 Mesh 2.1.5 Point-to-point 2.1.6 Point-to-multipoint 2.1.7 Hybrid 2.2 Transmission modes, circuit types and services: 2.2.1 Transmission modes Connection types: Simplex, Half Duplex, Full Duplex 2.2.2 Multidrop circuits 2.2.3 Private lines and Local loops 2.3 Private leased line versus Switched network **Course Outcome: CO2 Teaching Hours: 10**
3	**The Open Systems Interconnection OSI/ISO models:** 3.1 Need of OSI/ISO model 3.2 Function of each layer of the OSI model 3.2.1 Layer 1 – Physical, 3.2.2 Layer 2 – Data link, 3.2.3 Layer 3 – Network, 3.2.4 Layer 4 – Transport, 3.2.5 Layer 5 – Session, 3.2.6 Layer 6 – Presentation, 3.2.7 Layer 7 – application 3.3 List of protocols at each layer 3.4 TCP/IP model and Description **Course Outcome: CO3 Teaching Hours: 09**
4	**Multiplexing and Switching Technology:** 4.1 Definition of Multiplexing 4.2 Types of multiplexing: FDM, TDM, CDM 4.3 Comparison 4.4 Switching techniques: 4.4.1 Circuit switching 4.4.2 Message switching 4.4.3 Packet switching 4.5 Connector Types: Definition and Specification 4.5.1 RJ-11, RJ-45 4.5.2 BNC 4.5.3 RS-232 4.6 Wiring Standards: 4.6.1 Straight-through cable (586A)

	4.6.2 Crossover cable (586B) **Course Outcome: CO4 Teaching Hours: 8**
5	**Different network Components and devices:** 5.1 Network Components: 5.1.1 Repeater 5.1.2 Switch 5.1.3 Router 5.1.4 Hub 5.1.5 Bridge 5.1.6 Gateway 5.1.7 Modem 5.1.8 NIC 5.1.9 Media converters 5.1.10 Wireless access point 5.1.11 Firewall 5.1.12 DHCP server 5.2 Functions of specialized network devices: 5.2.1 Multilayer switch, Content switch. 5.2.2 Intrusion detection and Prevention system 5.2.3 Load balancer 5.2.4 Multifunction network devices 5.2.5 DNS server 5.2.6 Bandwidth shaper 5.2.7 Proxy server 5.2.8 Channel or data service unit 5.3 Private branch exchange 5.4 Comparison between Routing switching and bridging **Course Outcome: CO5 Teaching Hours: 09**

List of experiments: Total 10 experiments (for 1 turn) out of 15 experiments

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Study of different Networking Tools like Network and Telecom Crimping Tool / LAN Cable Tester / Line Tester.	02
2	2	CO2	Identify the different types of network topologies.	02
3	3	CO3	Familiarize with different Categories of Ethernet: Ethernet, Fast Ethernet, Gigabit Ethernet, 10G Ethernet. (Specification and Comparison)	02
4	4	CO4	Study different types of network cables.	02
5	5	CO5	To install devices like Printer / Router /Access Points	02
6	1	CO1	Implement Basic Network Commands	02
7	3	CO2	To configure IP addressing and sub netting concept	02
8	2	CO4	To configure LAN network using CAT5/6 cable and RJ 45 jack outlet Crimping	02

9	5	CO5	To connect and transfer files between multiple PC's using networking switch	02
10	5	CO4	To check connection using ping command and use of IP configuration command	02
11	4	CO1	To make cross-wired and straight cables using crimping tools	02
12	1	CO2	To study network troubleshooting techniques and commands including ping, tracert, netsh, ipconfig, and netstat etc.	02
13	5	CO3	To study sharing network devices (wired or wireless)	02
14	5	CO5	Make a Mini project by using different Network Components.	02
15	3	CO3	Do Case study on any one Network service provider company on their Network infrastructure and design	02
Total				**30**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and COs, Also experiment number 16 and 17 is compulsory. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Data communication	Behroz Forouzen, Tata Mc Graw Hill. 5th edition	ISBN13:9780073376226
2	Computer network	Tanenbaum, Pearson	ISBN13:9788131787571
3	Data & Computer Communications	William Stallings, Pearson	ISBN13:9789332518865
4	CCNA reference book	Online	

E-References:

1. https://ndl.iitkgp.ac.in
2. https://www.netacad.com/courses/networking
3. https://www.youtube.com

CO vs PO and CO vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	3	2	2	1	1	3	3	2
CO2	1	1	2	1	2	2	2	3	2	2
CO3	3	1	0	1	2	2	2	2	3	3
CO4	2	1	1	1	2	2	3	1	3	2
CO5	2	1	2	1	2	3	2	2	2	3

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Coordinator,
Curriculum Development,
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Head of Department
Department of Electronics

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19405**				Course Title: **Fiber Optic Communication**						
Compulsory / Optional: **Optional**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30 min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**50***	-	**25**	**175**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 and TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

Optical fiber based communication networks have become major information transmission system with high capacity links encircling the globe in both terrestrial and under-sea installation. Numerous passive and active optical devices within these links perform complex transmission and networking functions in the optical domain such as signal amplification, restoration, multiplexing, switching and routing etc. Knowledge of optical fiber technology is helpful in understanding of optical communication system, optical sources and detectors, various losses, optical links and related components.

Course Outcomes: Student should be able to:

CO1	Classify different types of Optical Fibres, its structure and components.
CO2	Describe and use different splicing techniques and connectors.
CO3	Understand different losses and attenuation in fiber optics.
CO4	Describe various sources and detectors used in FOC.
CO5	Explain multiplexing techniques in fiber optics.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Theory of Optics and Fundamentals of Optical Fiber** 1.1 Optical spectrum: Band name and its range 1.2 Fiber optics communication 1.2.1 Introduction 1.2.2 Advantages and disadvantages 1.2.3 Applications 1.3 Block diagram and working of Fiber Optic communication system. 1.4 Definition and concept of reflection, refraction, dispersion, diffraction, absorption and scattering with the help of light theory. 1.5 Ray theory transmission: Total internal reflection, Definition of critical angle,

	Acceptance angle, Numerical Aperture. **Course Outcome: CO1 Teaching Hours: 10 Marks: 08 (R- 4, U-4, A-)**
2	**Optical fiber Structure and Components** 2.1 Types of Fibers 2.2.1 Mono mode Step index 2.2.2 Multimode Step index 2.2.3 Multimode Graded index fiber 2.2 Components**:** Diagram and Function 2.2.1 Directional Couplers 2.2.2 Isolators 2.2.3 Circulators 2.2.4 Multiplexers 2.2.5 Filters 2.3 Types and Function of Optical Amplifiers, Switches and wavelength convertors. **Course Outcome: CO1 Teaching Hours :10 Marks:08 (R-2, U-4, A-2)**
3	**Signal Degradation in Optical Fibers** 3.1 Losses 3.1.1Typical Attenuation graph of standard fiber and its interpretation 3.1.2 Absorption mechanism 3.1.3 Scattering mechanism 3.1.4 Bending losses and its types 3.1.5 Core and cladding losses. 3.2 Signal Distortion in optical wave guides: Various dispersion mechanisms, group and phase delay concepts, bandwidth-distance product concept, cut off wavelength. **Course Outcome: CO3 Teaching Hours : 08 Marks:10 (R- 4, U- 6, A-)**
4	**Optical Sources and Detectors** 4.1 Concept of absorption, spontaneous emission and stimulated emission. 4.2 Concept of Heterojunction structure, concept of quantum efficiency. 4.2 LED: Diagram and working principle 4.2.1 Surface emitter LED . 4.2.2 Edge emitter LED 4.3 Laser Diodes: Diagram and working principle 4.3.1 Fabry - Parot resonator 4.3.2 Distributed feedback resonator (DBF) 4.3.3 Advantages of Laser 4.4 Photodetector: Diagram and working principle, advantages and applications 4.4.1 P-N photo diode 4.4.2 P-I-N photo diode. **Course Outcome: CO4 Teaching Hours :12 Marks:12 (R-4, U- 6, A- 2)**
5	**Power Launching and Coupling** 5.1 Source to fiber Launching. 5.2 Lensing schemes for coupling improvement: Fiber Misalignments, Fiber-to-fiber joints. 5.3 Fiber splicing methods**:** Diagram and working principle 5.3.1 Fusion splicing method 5.5.2 V-groove splicing method

	5.5.3 Elastic tube splicing method 5.4 Fiber connectors: Requirements of a good connector design, Types and Applications. 5.5 Attenuation measurements**:** OTDR block diagram and working principle. **Course Outcome: CO2 Teaching Hours :10 Marks: 10 (R- 2, U- 6, A- 2)**
6	**Multiplexing in Fiber Optic Communication** 6.1 Introduction to SONET and SDH. 6.1.1 SONET/SDH Rings: Diagram and working principle of i. Two fiber UPSR ii. Two fiber BLSR 6.2 Wavelength Division Multiplexing. 6.2.1 Definition and Necessity of WDM. 6.2.2 Advantages of WDM. 6.2.3 Block diagram and operational principles of WDM. 6.3 DWDM deployment of multiple wavelengths: Block diagram and working principle. 6.4 Link Power Budget: Block diagram of optical power loss model, explanation and formulas used. 6.6 Introduction to FTTH and (GPON) Gigabit passive optical network **Course Outcome: CO5 Teaching Hours :10 Marks: 12 (R- 4, U- 6, A-2)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Theory of optics and fundamentals of optical fiber**	4	4	-	08
2	**Optical fiber structure and components**	2	4	2	08
3	**Signal Degradation in Optical Fibers**	4	6	-	10
4	**Optical Sources and Detectors**	4	6	2	12
5	**Power Launching and Coupling**	2	6	2	10
6	**Multiplexing in Fiber Optic communication**	4	6	2	12
	Total	**20**	**32**	**08**	**60**

List of experiments: Total 10 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Setting Up of Fiber optic Analog link.	2
2	2	CO1	Setting Up of Fiber optic Digital link.	2
3	3	CO3	Measurement of NA of optical fiber.	2
4	4	CO4	Plot the characteristics of Fiber optic LED.	2

5	5	CO2	Joining of optical Fibers using different splicing techniques.	2
6	6	CO5	Perform Wavelength Division Multiplexing and Demultiplexing in optical fiber.	2
7	5	CO2	Measure the length of fiber spool using OTDR.	2
8	5	CO2	Calculate the splice loss and measure the length of fiber by using two fiber spool and OTDR.	2
9	5	CO2	Observe loss in LC/PC adapter and measure the length of fiber using spool and OTDR.	2
10	5	CO2	Observe attenuation and measure the length of fiber using spool and OTDR.	2
11	5	CO2	Plot the characteristics of Fiber optic Photo detector.	2
12	3	C03	Measurement of Bending Losses.	2
13	5	CO2	Mini project on simple optical transmitter and receiver or mechanical splicing optical connectors. (preparation and execution of actual mini project)	2
14	5	CO2	Mini project on simple optical transmitter and receiver or mechanical splicing optical connectors. (report writing)	2
15	1,2,3, 4,5,6	CO1, CO2, CO3, CO4, CO5	Case study on FTTH in any one locality in Mumbai	2
		Total		**30**

Note: Experiments No. 1 to 5 and 13 to 15 are compulsory and should map all units and CO. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Optical Fiber Communication	Gerd Keiser, Tata McGraw Hill	978125906876
2	Optical Network	Kumar Shiv Rajan, Morgan Kaufmann	978-0-12-374092-2
3	Optical Fiber Communication	John M Senior, Prentice Hall	81-203-0882-4
4	Gigabit passive optical network (GPON)	Srinath Srivatsa	978-1-4302-4873-6

E-References:

1. **http://www.bbcmag.com/2008issues/june08/BBP_June08_OtoL.pdf**
2. **http://www1.futureelectronics.com/doc/EVERLIGHT%C2%A0/334-15_T1C1-4WYA.pdf**
3. **For virtual lab : http://vlab.co.in**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	1	2	1		
CO2	2	1	3	3	1	3	2	3	3	2
CO3	2	3	3	3	1	1	2	3	3	2
CO4	3	2	1	2	1	1	2	3	3	
CO5	2	1	3	3	1	1	2	3	2	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr Kiran Raghawan	Project Manager	Tejas Industry, Mumbai
2	Dr G.G.Sarate	HOD, Electronics	G.P. Amravati
3	Mrs S.V.Bannore (Curriculum Content Designer)	Sr.Lecturer	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19406**				Course Title: **Mobile Communication**						
Compulsory / Optional: **Optional**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30Min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**50***	-	**25**	**175**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tesst are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

The 21st century has brought the rapid growth of cell phones, LAN and wireless appliances. Wireless communication is driving the whole world towards greater integrity. RF spectrum in higher bands is available for mobile communications. Mobility awareness in civilized societies, global standardization of wireless devices and products are leading towards huge growth. Students will know the fundamentals of mobile communication, basics of cellular system and different services provided by the cellular system. This subject gives the knowledge of cellular system architecture, components and its application along with its standards .It is the application of wireless digital communication.

Course Outcomes: Student should be able to

CO1	Describe different mobile communication system and their Antennas.
CO2	Understand Hand off strategies, Interference, coverage and capacity in cellular system.
CO3	Illustrate call flow sequences in GSM.
CO4	Comprehend the concept of CDMA (IS-95) standards, SS7 services and IMT 2000.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to wireless communication system:** 1.1 Working Principle of Wireless Communication. 1.2 Evolution of mobile radio communications (2G, 2.5G, 3G and 4G) 1.3 Introduction of Mobile radio system around the world. (Such as AMPS, N- AMPS, IS-95, GSM). 1.4 Applications of wireless communication systems such as paging system, cordless telephone system, cellular telephone system. 1.5 Call processing in cellular telephone system. **Course Outcome: CO1 Teaching Hours:10 Marks:10 (R- 4, U-4, A-2)**

2	**Mobile unit:** 2.1 Block Diagram and operation of mobile unit. 2.2 Block Diagram and Explanation of frequency synthesizer, transmitter, receiver, logic unit, control unit. 2.3 Essential features of handset. 2.4 Definition of mobile base station, Mobile control station. **Course Outcome: CO1 Teaching Hours:06 Marks:08 (R-4, U- 4, A--)**
3	**The cellular concept:** 3.1 Introduction of cellular system. 3.1.1 Frequency reuse concept. 3.1.2 Introduction of SDMA 3.1.3 Hand off strategies and their Types. 3.2 Interference and system capacity. 3.2.1 Co channel interference and system capacity 3.2.2 Channel planning for wireless system. 3.2.3 Adjacent channel Interference 3.3 Improving coverage and capacity in cellular system. 3.3.1 Cell splitting 3.3.2 Sectoring 3.3.3 Repeater for range extension 3.3.4 Micro cell zone concept **Course Outcome: CO2 Teaching Hours:14 Marks:14 (R-6, U-6, A-2)**
4	**Cell-Site Antennas and Mobile Antenna**: 4.1 Equivalent circuit of Antenna. 4.2 The Gain-and-Pattern relationship. 4.3 Sum-and-Difference Pattern. 4.4 Antenna at Cell site. 4.5 Unique Situations of Cell-Site. 4.6 Mobile Antennas. **Course Outcome: CO1 Teaching Hours:10 Marks:08 (R-4, U-4, A--)**
5	**Digital cellular mobile systems:** 5.1 G.S.M: 5.1.1 GSM Standardization and service aspects 5.1.2 GSM Architecture 5.1.3 G.S.M Radio Aspects 5.1.4 Security Aspects 5.1.5 Typical call flow sequences in GSM 5.2 Signal system no.7 (SS7): services and performance. 5.3 IS-95: Concept of IS 95, the North American CDMA Digital Cellular standard. [08] 5.3.1 Introduction 5.3.2 Service Aspects 5.3.3 Network reference Model and Security aspects 5.3.4 Radio aspects

	5.3.5 Key features of IS 95 CDMA systems **Course Outcome: CO3 and CO4 Teaching Hours:12 Marks:14 (R-8 , U-6, A--)**
6	**Modern wireless communication system and Networks:** 6.1 State features of 3G wireless networks- UMTS, CDMA 2000. 6.2 WLL(Wireless local loop) and LMDS (local multipoint distribution) technology 6.3 IMT 2000: 6.3.1 IMT 2000 Vision and Evolution Aspects. 6.3.2 Radio Spectrum for IMT -2000. **Course Outcome: CO4 Teaching Hours:08 Marks:06 (R-2, U-2, A-2)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction to wireless communication system**	4	4	2	10
2	**Mobile unit**	4	4	-	08
3	**The cellular concept**	6	6	2	14
4	**Cell-Site Antennas and Mobile Antenna**	4	4	-	08
5	**Digital cellular mobile systems**	8	6	-	14
6	**Modern wireless communication system and Networks**	2	2	2	06
	Total	**28**	**26**	**06**	**60**

List of experiments: Total 10 experiments out of 15 experiments

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Perform installation of mobile phone.	02
2	1	CO2	Observe Input / Output signal of different sections Mobile unit.	02
3	2	CO3	Read the content of SIM card.	02
4	2	CO4	To understand and perform charging of handset.	02
5	2	CO2	Testing of mobile handset.	02
6	2	CO2	Find out different add- on accessories for cell phones (battery, charger, hands free data cable)	02
7	2	CO3	Identify different sections and component of mobile unit (Ringer section, dialer section, receiver section, transmitter section etc.)	02
8	2	CO3	To Trace different sections of Mobile Unit.	02

9	3	CO3	Demonstration of handoff, frequency response, cell splitting.	02
10	3	CO3	Prepare report on different facilities provided by cellular company (visit)	02
11	3	CO3	Prepare report on cellophane operator companies and their plan and traffic. (Visit)	02
12	5	CO3	Prepare report on GSM technology, its network, GSM capability & data Services.	02
13			Case study: features, services provided by different companies	02
14			Mini Project: Electronic notice board using GSM, Vehicle tracking system, Home security system etc. Note: Only software or program required (No need of Hardware)	04
Total				**30**

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and COs. Remaining experiments are to be performed depending on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Wireless Communication Principles & Practice	T.S. Rappaport, Pearson Education	978-0130422323
2	Mobile communication System	William Lee, Tata McGraw Hill	9780070370395
3	Mobile Computing	Asoke Talukder, Roopa Yavagal, Tata McGraw Hill	9780070588073
4	Mobile Communication	Jochen Schiller, Pearson Education Asia	9780201398366
5	Mobile and Personal Communication Systems and Services	Raj Pandya, IEEE Press, PHI	0471660965, 9780471660965
6	Mobile wireless Networks	C K Toh Ad Voc, Pearson Education	9780130078179

E-References:

1. https://ndl.iitkgp.ac.in/
2. https://www.electronicshub.org/
3. https://www.tnuda.org.il/
4. www.youtube.com

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	-	1	1	2	1	2	-
CO2	2	2	2	-	1	1	2	1	2	2
CO3	3	1	1	1	1	-	2	1	2	2
CO4	2	1	1	-	1	1	2	-	2	-

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mrs. Salunke Suvarna	Sr. Controls Engineer	Vanderlande Industries Software Pvt Ltd.Pune
2	Mrs. Chavhan Monali	Lecturer in Electronics	Government Polytechnic, Vikramgadh
3	Mrs. Puri Sanyogeeta B.	Lecturer in Electronics	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(Fifth Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme:Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - V**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19304	Project and Seminar.	0	4	0	4	4	0	0	0	0	50*	50	100
EC19408	Consumer Electronics.	3	4	0	7	7	60@	20@	20@	0	50	50	200
EC19409	Advanced Communication.	4	2	0	6	6	60	20	20	0	50*	50	200
EC19411	Automation	3	4	0	7	7	60	20	20	50	0	50	200
EC19410	Elective 2 (VLSI)	3	4	0	7	7	0	0	0	0	50*	50	100
EC19412	Elective 2 Introduction to AI												
EC19413	MOOC (IOT/Latex/Arduino)	**0**	4	0	4	4	0	0	0	0	0	0	0
	Total	**13**	**22**	**0**	**35**	**35**	**180**	**60**	**60**	**50**	**200**	**250**	**800**
Total Contact Hours					**35**								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,**#** indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19304**				Course Title: **Project and Seminar**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
-	**4**	-	**4**	-	-	-	-	**50***	**50**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 and TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination **Note**: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

The basic objective of project work is to ignite potential of student's creative ability by enabling them to develop some model which has social relevance and should provide a taste of real life problem that a diploma holder may encounter as a professional. Projects mainly serve the purpose of inculcating skills like taking initiative, creativity, innovation, planning and decision making, persistence, working as a team, habit of keeping records, presentation and to present a comprehensive report of their work.

Course Outcomes: Student should be able to

CO1	Develop skills and innovate ideas to use latest technology to solve real life problems.
CO2	Develop hardware / software project.
CO3	Troubleshoot and test the project.
CO4	Acquire communication skills, leadership qualities, ethics and technical writing skills.
CO5	Assess the impact of the project on society.

Course Content Details:

Unit No	General Guidelines
1	Project work is conceived as a group work through which the spirit of team building is expected to be developed. Students shall take a project in a group [group size should be of 2-5 students] in the beginning of semester in consultation with project guide and the project must be completed by end of the semester.
2	Students will be required to carry out their project work in groups under the supervision of faculties of their core discipline who will work as project guides. The respective project guide should regularly monitor the progress of project work.

3	The project work must be carried out either in institute (in- house project) or in industry (in case of industry sponsored project)
4	Selection and approval of project topic: • Project topic should be related to real life problems or industrial application. • Project topic must be designed and implemented by electronic concept/techniques. • The investigation of practical problems in electronic application field and their proposed solutions can be worked out. • Investigation of latest development in a specific field of electronics is also accepted. • Software development projects related to electronics along with the hardware may be accepted. • Inter-disciplinary project may be encouraged.
5	• The project pre-synopsis/proposal (3-4 pages) must be submitted in the institute at the beginning of the semester. While submitting a project pre-synopsis/proposal care is to be taken that project will be completed within the available time of semester. Project title should be precise and clear.
6	The project group is expected to complete the following task within 3 weeks from start of semester. • Selection of project topic. • Literature survey. • Planning and design of project. • Identification and selection of required hardware components and software.
7	The project group should maintain a diary of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by project guide in every week.
8	Students should complete project in all respect (fabrication, assembly, development of hardware/software, implementation, testing, and validation).
9	The guides should regularly monitor the progress of the project work.
10	The project work along with project report should be submitted as part of term work before the term end date.
11	Project report must be submitted in the prescribed format only.

Suggested contents of the Project report

- Title page (Name of team members and Guide)
- Certificate
- Acknowledgements
- Abstract
- Content page

  Chapters

  1. Chapter -1 Introduction (User based Problem/task or background of the Industry)
  2. Chapter -2 Literature Survey (to finalize and define Problem Statement)
  3. Chapter -3 Scope of the Project
  4. Chapter -4 Methodology
  5. Chapter - 5 Details of designs, working and process
  6. Chapter - 6 Results and Applications
  7. Chapter - 7 Conclusions and future scope
  8. References and Bibliography

(No. of copies of Project report to be prepared = S+2, where S is no. of students in group).
The project group shall present the final project live and give power point presentation using LCD projector to the internal department committee for assessment of the project for award of TW marks. Assessment will be done by an internal department committee (consisting of respective guide and two faculty) as per rubrics decided by the department.

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**1**	**1**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**
CO4	**2**	**3**	**2**	**1**	**2**	**3**	**3**	**1**	**2**	**1**
CO5	**1**	**2**	**1**	**2**	**3**	**2**	**3**	**1**	**1**	**1**

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr.Rishikesh Gawade	Director	Electroblaze, Mumbai
2	Mrs N.A.Palaspagar	Sr. Lecturer	VYES Mumbai
4	Mrs S.V.Bannore (Curriculum Content Designer)	Sr. Lecturer	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics

I/C, Curriculum Development Cell

Principal

Rubric I: Project TW Max Marks : 50

Criterion No	Criterion	CO	Max Marks	Not Satisfactory (1-4)	Satisfactory (5-6)	Good (7-8)	Excellent (9-10)
1	Problem Identification		10	Little or no background information is presented to help the audience understand the history and significance of the project.	Background information is provided, an explanation of why the project was undertaken, to help put the presentation in context.	Background information is provided, including references to the work of others and an explanation of why the project was undertaken, to help put the presentation in context.	Insightful and in-depth background information is provided to illuminate the issues through inclusion of history relevant to the presentation, a succinct description of the significance of the project.
2	Literature Review		10	Very few and not relevant	Few and relevant	Relevant information from multiple sources	Information is gathered from multiple, research-based sources.
3	Planning of Project Work And Team Structure		10	Time frame not properly specified, In-appropriate distribution of project work	Time frame properly specified, but not being followed, Distribution of project work un-even	Time frame properly specified and being followed Distribution of project work inappropriate	Time frame properly specified and being followed, Appropriate distribution of project work
4	Testing		10	Testing done not done properly , no correct method of testing	Testing done in single condition , required modification not done after testing	Testing done in multiple condition , required modification not done after testing	Testing demonstrates engineering skill , required modification done after testing
5	Project Report		10	Project report not prepared according to the specified format, References and citations are not appropriate.	Project report is according to the specified format but some mistakes In-sufficient references and citations	Project report is according to the specified format, References and citations are appropriate but not mentioned well	Project report is according to the specified format References and citations are appropriate and well mentioned

Rubric II: Project **OR Max Marks: 50**

1	Description of Concepts and Technical Details		20	Inappropriate explanation of the key concepts, Poor description of the technical requirements of the project **(1-8)**	Explanation of the key concepts In-sufficient description of the technical requirements of the project **(9-12)**	Complete explanation of the key concepts, enough description of the technical requirements of the project **(13-16)**	Complete explanation of the key concepts, Strong description of the technical requirements of the project **(17-20)**
2	Project Demonstration		20	Modules are not in proper working form. Students are unaware of the problem **(1-8)**	Modules are not in proper working form. Students are aware of the problem **(9-12)**	Each module working well but not properly demonstrated **(13-16)**	Each module working well and properly demonstrated **(17-20)**
3	Conclusion and Discussion		10	Results are not presented in appropriate manner Project work is not properly summarized and concluded, Future extensions not mentioned **(1-4)**	Results are presented in appropriate manner Project work is not properly summarized and concluded, Future extensions in the project not very relevant **(5-6)**	Results are presented in very appropriate manner Project work is well summarized and concluded Future extensions in the project not very relevant **(7-8)**	Results are presented in very appropriate manner Project work is well summarized and concluded Future extensions in the project are well specified **(9-10)**

*Evaluation of OR, for project will be based on above rubric II

Government Polytechnic, Mumbai

Department of ELECTRONICS ENGG

Project

Weekly diary

GOVERNMENT POLYTECHNIC, MUMBAI
(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)
ACADEMIC YEAR (----------)
Odd/Even Term (--------- to --------)
Department of _____

DETAILS OF PROJECT GROUP

Class: III Yr. Shift: I/ II

Course: Project

Name of Project: _____

Name of Guide Allotted: _____

Student's Information:

Sr. No	Enrolment. No	Name of student	Email id	Contact No

Type of project: Based on latest technology/ based on research going on/Laboratory requirement/ Institute Requirement/Societal need (Tick appropriate type)

If Industry sponsored project

Industry Name:

Name of industry guide:

Contact No:

Email id:

GOVERNMENT POLYTECHNIC, MUMBAI
(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)
ACADEMIC YEAR (----------)
Odd/Even Term (--------- to --------)
Department of _____
Week-Wise Progress Report

Course Title : Project
Week No:
Activity done *:

Task / Suggestion given by guide:

Signature of Guide

Note: * activity can be literature survey, market survey, visit to industry/ Exhibition, learning new skill/software, preparation of seminar, seminar document preparation

For week wise progress report, use as many page as required.


GOVERNMENT POLYTECHNIC MUMBAI
GPM
ESTD. 1960
MAKING KNOWLEDGE TO WORK

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19408**				Course Title: **Consumer Electronics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (1 Hr)	TS1 (30min)	TS2 (30min)	PR	OR	TW	Total
03	**04**	**-**	**07**	**60@**	**20@**	**20@**	**-**	**50**	**50**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at mid-term and second skill test at the end of the term

Rationale:

Consumer electronics appliances are increasing day by day. This requires large number of technically trained man power in the relevant industries. Looking towards the present need, in -depth knowledge for maintaining various consumer electronics appliances/equipment is necessary for diploma engineering pass out students. This course will introduce the students with working principles of consumer electronics appliances like audio-video systems, microwave oven, washing machine, air- conditioner, camcorder and others to develop skills to troubleshoot in systematic way. Knowledge so gained would also help in production units of these consumer gadgets or help the students to start their own enterprises.

Course Outcomes: Student should be able to

CO1	Troubleshoot audio systems
CO2	Test the working of various colour TV
CO3	Troubleshoot colour TV receivers
CO4	Interpret the working of consumer electronic appliances.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Audio Systems** 1.1 CD player: 1.1.1 Block diagram 1.1.2 Working principle 1.1.3 Types of CD player 1.1.4 Component used for CD mechanism: CD pick-up assembly, gear system, drive motors, CD lens. 1.2 Hi Fi amplifier: 1.2.1 Block diagram 1.2.2 Working principle 1.3 Public address (PA) system: 1.3.1 Block diagram 1.3.2 Working principle

	1.3.3 Speaker impedance matching and characteristics 1.5 Home theatre system. 1.6 Trouble shooting procedure of audio systems. **Course Outcome: CO1 Teaching Hours : 6 hrs Marks: 08 (R- 2, U-4, A-2)**
2	**Television Fundamentals and Colour Television.** 2.1 Components of a TV system-Aspect ratio, image continuity, interlace scanning, scanning periods-horizontal and vertical, vertical and horizontal resolution. 2.2 Vestigial side band transmission, bandwidth for color signal, characteristics of color signal, compatibility. 2.3 Color TV Camera: 2.3.1 Block diagram 2.3.2 Working principle (Vidicon). 2.4 Color TV Picture Tube: 2.4.1 Block diagram 2.4.2 Working principle. 2.5 Color TV Transmitter: 2.5.1 Block diagram 2.5.2 Function of each block. 2.6 Troubleshooting procedure of Color TV Transmitter 2.7 Block diagram and operation of Color TV receiver: 2.7.1 Block diagram 2.7.2 Function of each block 2.8 Troubleshooting procedure of Color TV Receiver systems. **Course Outcome: CO2,CO3 Teaching Hours : 08 Marks: 12 (R-2, U- 4, A- 6)**
3	**LCD and LED Television and Cable Television.** 3.1 LCD Television: 3.1.1 Basic principle 3.1.2 Working principle 3.2 LED Television: 3.2.1 Basic principle 3.2.2 Working principle. 3.3 Cable Television: 3.3.1 Concept 3.3.2 Working principle 3.4 Direct to Home Receiver (DTH): 3.4.1 Concept 3.4.2 Receiver block diagram 3.4.3 Indoor and outdoor unit. 3.5 HDTV : 3.5.1 Development of HDTV 3.5.2 NHK MUSE System and NHK Broadcast. 3.6 CCTV : 3.6.1 Working principle

	3.6.2 Block diagram 3.6.3 Applications 3.6.4 Installation steps. 3.7 Smart TV : 3.7.1 Block diagram 3.7.2 Working principle. **Course Outcome: CO2 Teaching Hours : 07 Marks: 12 (R-4 , U- 4, A-4)**
4	**Miscellaneous Appliances.** 4.1 UPS : 4.1.1 Types 4.1.2 Block diagram 4.1.3 Working Principle 4.1.4 Basic troubleshooting steps for UPS. 4.2 SMPS: 4.2.1 Types 4.2.2 Block diagram 4.2.3 Working Principle 4.1.4 Basic troubleshooting steps for SMPS 4.3 Air Conditioners: 4.3.1 Block diagram 4.3.2 Working Principle 4.3.3 Basic troubleshooting steps 4.4 Refrigerators: 4.4.1 Block diagram 4.4.2 Working Principle 4.4.3 Basic troubleshooting steps 4.5 Mixer: 4.5.1 Block diagram 4.5.2 Working Principle 4.5.3 Basic troubleshooting steps **Course Outcome: CO4 Teaching Hours : 08 Marks: 08 (R-4, U-2, A-2)**
5	**Office Gadgets** 5.1 Personnel Computer: 5.1.1 Components in the central unit 5.1.2 Computer peripherals. 5.2 Printer: 5.2.1 Types 5.2.2 Block diagram 5.2.3 Components of Printer 5.2.4 Working principle 5.2.5 Installation Procedure 5.3 Scanner: 5.3.1 Block diagram 5.3.2 Components of Scanner 5.3.3 Working principle

	5.3.4 Installation Procedure 5.4 Mobile systems: 5.4.1 Study of parts inside a mobile phone 5.4.2 Study of various faults. 5.5 FAX Machine: 5.5.1 Block diagram 5.5.2 Components of FAX Machine 5.5.3 Working principle. 5.6 EPABX: 5.6.1 Block diagram 5.6.2 Components of EPABX 5.6.3 Working principle. **Course Outcome: CO4 Teaching Hours : 08 Marks: 10 (R-4, U- 4, A- 2)**
6	**Consumer Electronics Appliances** 6.1 Photocopier: 6.1.1 Block diagram 6.1.2 Working principle 6.2 Microwave Oven: 6.2.1 Types 6.2.2 Block diagram 6.2.3 Wiring and safety instructions and electrical specifications. 6.3 Washing Machine: 6.3.1 Block diagram of washing machine 6.3.2 Electrical specifications 6.3.3 Types of washing machine : Automatic, Semi-automatic 6.3.4 Trouble shooting procedure. 6.4 Digital Camera and Cam coder: 6.4.1 Pickup devices 6.4.2 Picture processing and picture storage 6.4.3 Electrical specifications. **Course Outcome: CO4 Teaching Hours : 08 Marks: 10 (R- 2 , U-4 , A-4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Audio Systems**	02	04	02	08
2	**Television Fundamentals and colour television.**	02	04	06	12
3	**LCD and LED Television and cable Television.**	04	04	04	12
4	**Miscellaneous Appliances.**	04	02	02	08
5	**Office Gadgets**	04	04	02	10
6	**Consumer Electronics Appliances**	02	04	04	10
	Total	**18**	**22**	**20**	**60**

List of experiments: Total 10 experiments (Minimum) should be performed.

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1 2	CO1 CO2	• Install/Test the CD for given type of data. • Suggest the remedy for the created faults and in the given colour TV trainer kit for the following fault a) No colour b) Red colour only, c) Green colour only d) No sound.	02 02
2	3	CO3	• Test the various sections of LED Television receiver.	04
3	4	CO4	• Troubleshoot air conditioning or refrigerator.	04
4	5 1	CO4 CO1	• Test the various features of the given type of printer. • Select exact speed to write a CD for given type of data.	02 02
5	6	CO4	• Interpret the working of automatic washing machine.	04
6	2	CO2	• Use multimeter to test various test points at horizontal sections of colour TV receiver.	04
7	3	CO3	• Installation of CCTV.	04
8	4	CO4	• Troubleshoot UPS or Mixer.	04
9	5 6	CO4 CO4	• Demonstration of working of FAX machine • Test the various functions of Cam coder.	02 02
10	2	CO2	• Use multimeter to test various test points of colour TV receiver. a) Chroma section b) Picture Tube.	04
11	2 2	CO2 CO2	• Use multimeter to test various test points of horizontal section of colour TV receiver. • Use multimeter to test voltage at various points of vertical section of colour TV receiver.	02 02
12	2 2	CO2 CO2	• Suggest the remedy for the following faults in colour TV: a) Faults in SYNC separator. B) Faults in video amplifier. • Measure voltage levels to sketch composite video signal at different stages of TV receiver.	02 02
13	3 3	CO3 CO3	• Test the various sections of LCD television receiver. • Suggest the remedy for the following faults in given colour TV: a) Faults in HSYNC section b) Fault in VSYNC section.	02 02
14	6 3	CO4 CO2	• Demonstration of working of Microwave oven • A case study: Compare LED and LCD TV on the basis of specifications, working etc	02 02
15	3	CO3	• Mini Project: Trouble shooting procedure of Smart TV or any topic suggested by teacher.	04
Total				**60**

Note: Experiments No. 1 to 5 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Consumer Electronics	Bali, S.P. Pearson education, India, Delhi, 2007	9788131717592
2	Audio Video systems principles, maintenance and troubleshooting.	Gupta, R.G. Mc-graw hill, New Delhi, India 2010	9780070699762
3	Audio Video systems: principle practices and troubleshooting.	Bali, Rajeev, Bali,S. P. Khanna book publishing Co.(P) Ltd. Delhi,2014	9788187522058
4	Trouble shooting electronic equipment	R. S. Khandpur, Tata McGraw hill	9780071477314

E-References:

1. https://www.youtube.com/watch?v=8HG7efTMj78
2. https://www.electronicrepairguide.com/led-tv-repair-basic .html
3. https://www.computer-pdf.com/tutorials-computer-repair-and-maintenance
4. https://www.thespruce.com/refrigerator-repair-guide-4153173

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	2	1	-	2	2	3	2
CO2	1	2	2	3	-	-	1	2	2	-
CO3	2	3	2	3	1	-	2	2	3	2
CO4	1	-	-	1	-	3	2	2	1	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Santosh Kamble	Director	SaiTronics Mumbai.
2	Prof. Anjum Mujawar	HOD, Electronics Engineering	Vidyalankar Polytechnic, Mumbai.
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4	Dr. H. M. Pardeshi	Lecturer in Electronics Engg	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19409**				Course Title: **Advanced Communication Systems**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	**2**	**-**	**6**	**60**	**20**	**20**	**-**	**50***	**50**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

Electronic communication plays vital role in our daily life. Now a days modern high capacity telecom networks based on microwave principles satellite communication, mobile communication and radar systems becomes integral part of industry, society and other organizations. This course is useful as a basic to acquire in depth knowledge of advanced communication system and for analysis of these systems.

Course Outcomes: Student should be able to

CO1	Use specified waveguides in microwave communication.
CO2	Describe construction and working of microwave devices.
CO3	Illustrate working principle of Satellite communication.
CO4	Interpret Radar based Systems for range detection.
CO5	Explain different spread spectrum techniques.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Wave Guide and Components** 1.1 Introduction to basics of microwave transmission: 1.1.1 Microwave spectrum, band designations and applications of microwave, Comparison of wave guide with two wire transmission line 1.1.2 Rectangular waveguides: Propagation of waves through rectangular wave guide, Reflection of waves from a conducting plane, dominant mode, the parallel plane waveguide, cut off wavelength, cut off frequency, group and phase velocity. (Simple numerical) 1.1.3 Rectangular waveguide modes: TE mode, TM mode, TEM mode, field

	patterns of TE1,0, TE2,0, TE1,1 modes. 1.2 Circular waveguide : 1.2.1 Field patterns for dominant mode, 1.2.2 Advantages and applications of circular waveguide 1.3 Waveguide Passive components 1.3.1 Ferrites components: Isolators, circulators and Accessories (Flanges, Rotating coupling, Bends and corners, Taper and Twist). 1.3.2 Multiple Junctions - E plane, H- plane and Magic Tee junction. 1.3.3 Directional coupler – Working principle and application of Directional coupler. **Course Outcome: CO1 Teaching Hours :12 Marks: 12 (R-2, U-6, A-4)**
2	**Microwave Devices** 2.1 Microwave vacuum tube devices: Construction, working principle and applications of 2.1.1 Two cavity Klystron amplifier 2.1.2 Reflex Klystron 2.1.3 Magnetron 2.1.4 TWT. 2.2 Microwave semiconductor devices: Construction, working principle and applications of 2.2.1 Gunn diode, Gunn diode as an oscillator 2.2.2 IMPATT diode 2.2.3 PIN diode, PIN diode as an amplifier and oscillator 2.2.4 Tunnel diode. **Course Outcome: CO2 Teaching Hours :14 Marks: 14 (R-4, U-6, A-4)**
3	**Satellite Communication System** 3.1 Introduction to satellite communication system: 3.1.1 Importance of satellite communication system 3.1.2 Uplink & downlink frequencies 3.1.3 Satellite frequency bands 3.1.4 Applications of Satellite Communication 3.2 Basic terminology used in satellite communication: 3.2.1 Latitude 3.2.2 Longitude 3.2.3 Look angle 3.2.4 Elevation angle 3.2.5 Azimuth angle 3.2.6 Altitude 3.2.7 Footprint 3.2.8 Station keeping 3.3 Block diagram and function of satellite earth station, transponder. 3.4 Communication Satellite orbit and types: 3.4.1 LEO 3.4.2 MEO

	3.4.3 GEO. 3.5 Subsystems of satellite: Block diagram and working Principle of 3.5.1 Power subsystem 3.5.2 LNA 3.5.3 Attitude control subsystem 3.5.4 Thermal control subsystem 3.5.5 Repeaters 3.5.6 Telemetry tracking and command subsystem 3.5.7 Main and auxiliary propulsion subsystem 3.5.8 Antenna subsystem **Course Outcome: CO3 Teaching Hours :12 hrs Marks: 12 (R-4, U-4, A-4)**
4	**RADAR Systems** 4.1 Basic block diagram of RADAR system. 4.2 RADAR performance factors: 4.2.1 RADAR range equation 4.2.2 Factors influencing max. Range 4.2.3 Effect of noise. 4.3 Basic pulse Radar system: Block diagram and working principle 4.4 Antenna scanning (Definition, types and principle): 4.4.1 Horizontal 4.4.2 Vertical 4.4.3 Helical 4.4.4 Spiral. 4.5 Antenna tracking (Types and principle): 4.5.1 Sequential 4.5.2 Conical 4.5.3 Monopusle 4.6 Display Methods: 4.6.1 A-Scope 4.6.2 PPI 4.6.3 Automatic target detection 4.7 Doppler Effect: Statement 4.8 Block diagram and working of : 4.8.1 CW Doppler RADAR 4.8.2 FM CW Doppler RADAR 4.8.3 MTI RADAR. 4.9 RADAR Becons **Course Outcome: CO4 Teaching Hours :12 hrs Marks:14 (R-2, U-8, A-4)**
5	**Spread Spectrum Modulation** 5.1 Introduction to Spread Spectrum (SS) modulation: Block diagram, advantages and applications 5.2 Pseudo Noise sequence: Definition, Generation and maximum length sequence. 5.3Types of SS modulation: Block diagram, working principle and comparison of 5.3.1 Direct sequence spread spectrum (DSSS)

	5.3.2 Frequency hopped spread spectrum (FHSS) **Course Outcome: CO5 Teaching Hours :10 hrs Marks:08 (R-4, U-4, A-0)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Wave Guide and Components	2	6	4	12
2	Microwave Devices	4	6	4	14
3	Satellite Communication System	4	4	4	12
4	RADAR Systems	2	8	4	14
5	Spread Spectrum Modulation	4	4	0	8
	Total	**16**	**28**	**16**	**60**

List of experiments: Total 10 experiments out of 15 experiments

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Write specifications of Microwave Test Bench and five major Microwave components.	2
2	2	CO2	Demonstrate characteristics of Reflex Klystron.	2
3	3	CO3	Transmit and receive PC data through Satellite link.	2
4	4	CO4	Demonstrate effect of different types of materials on RADAR reception or detection.	2
5	4, 5	CO4, CO5	Case study: Prepare a report on applications of RADAR system in Defence and Air Navigation or any one application of Spread spectrum modulation / any topic provided by faculty.	2
6	1	CO1	Demonstrate characteristics of microwave tees E-plane and H-plane.	2
7	1	CO1	Demonstrate characteristics of microwave tees E-H plane.	2
8	1	CO1	Demonstrate characteristics of Isolators.	2
9	1	CO1	Demonstrate characteristics of circulators.	2
10	1	CO1	Demonstrate properties of Multi hole Directional coupler.	2
11	3	CO3	Write a report on - Transmit and receive Audio and Video signals through Satellite link.	2
12	3	CO3	Conversion of uplink and down link frequencies in digital Satellite communication systems.	2
13	4	CO4	Use freeware/open source simulation tool/virtual lab to perform practical related RADAR communication.	2
14	4	CO4	Mini Project: Write a report on - Determine velocity of moving object with the help of RADAR range / any topic suggested by	2

			faculty.	
15	1,2,3 ,4,5	CO1, CO2, CO3	Visit to a BSNL / MTNL / Earth station / Radio station / Airport /.	2
		Total		**30**

Note: Experiments No.1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Microwave Engineering	Gupta, Sanjeev, Khanna Publication, 2015.	978-8174090878
2	Microwave and RADAR Engineering	Gautam A.K., SK Kataria Publication	978-9330141519
3	Microwave and RADAR Engineering	M. Kulkarni, Umesh Publication	978-8188114009
4	Electronic Communication Systems	Kennedy, Davis , Mc-Graw Hill	978-0071077828
5	Satellite Communication	Roddy Dennis, Tata Mc-Graw Hill, 2017	978-0070077850
6	Satellite Communication Concepts & Applications	Rao Raja K N, PHI 2012	978-8120347250

E-References:

1. Microwave Components: www.youtube.com/microwave components and devices
2. Microwave fundamentals: www.nptlvideos.in/microwave engineering
3. RADAR: www.youtube.com/ RADARs
4. www.isro.gov.in
5. Microwave: www.learnerstv.com/free-engineering
6. Waveguide: www.academia.edu/waveguide

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	2	3	2	2
CO2	2	2	2	3	2	-	2	3	2	2
CO3	3	1	1	3	2	3	2	3	2	3
CO4	3	3	1	3	2	-	2	3	2	3
CO5	2	1	-	1	-	2	2	2	2	1

Industry Consultation Committee:

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1	Mr. Milind R. Patil	Sr. Manager	JSW Steel Works Dolvi.
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3	Mrs. Pranali Gahukar	Lecturer	Government Polytechnic Pen.
4	Mrs. Suvidha M. Patil	Lecturer	Government Polytechnic Mumbai.

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Head of Department
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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19411**				Course Title: **Automation**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**4**	**-**	**7**	**60**	**20**	**20**	**50**	–	**50**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 and TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Nowadays in most of the industries for automation, monitoring and controlling various industrial operations PLC and SCADA systems are being used. Hence the knowledge of PLC and SCADA system is essential to diploma holder. This course is introduced to the students of Electronics to get familiar with PLC and SCADA systems and their industrial applications. To drive the automation to a next level, IoT is becoming an important aspect of our life . Thus in this course student will get a brief introduction about IoT and its applications.

Course Outcomes: Student should be able to

CO1	Understand the basic concepts of PLC.
CO2	Demonstrate the operation of PLC, identifying its elements and using various instructions for various applications.
CO3	Understand the basic concepts and working of SCADA system for various applications.
CO4	Install and configure PLC software.
CO5	Understand the basic concept of Internet of Things.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to PLC** 1.1 Introduction to Automation 1.1.1 Definition 1.1.2 Need for Automation 1.1.3 Levels of Automation process - Supervisor level, control level, field level 1.1.4 Types of Automation Systems – Fixed, Programmable, Flexible, Integrated

	1.1.5 Advantages and Disadvantages of Automation 1.2 Introduction of PLC 1.3 Advantages and Disadvantages of PLC. 1.4 Block diagram and functions of Elements of PLC 1.5 Input-Output Devices - Definition, examples 1.6 Basic concept of module 1.6.1 Types of modules: Input modules and output modules : DC I/O module, Analog I/O module , block diagram , AC I/O module 1.6.2 Types of Instruments: Analog (Valve, motor etc.), Digital (switches, pushbuttons etc.) 1.7 Programming devices types 1.8 Operation of PLC 1.9 Types of PLC: fixed and modular PLC 1.10 Programming Languages for PLC (Introductory approach) 1.11 Wiring diagram for connection of I/O devices ,concept of sourcing and sinking 1.12 Specifications of PLC **Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 10 (R-2, U-6, A-2)**
2	**PLC Instructions** 2.1 Basic concept of ladder, Rules of ladder 2.2 Data files introduction 2.3 Classification of PLC instructions 2.3.1 Bit type instructions 2.3.2 Comparison instructions 2.3.3 Logical instructions 2.3.4 Timer 2.3.5 Counter 2.3.6 Maths 2.3.7 Advanced maths 2.3.8 Sequencer instructions 2.3.9 Data transfer instructions 2.3.10 PID control instruction 2.3.11 Bit shift 2.3.12 Branching instructions 2.3.13 Input / Output instructions 2.4 Simple ladder diagrams on instruction set **Course Outcome: CO2 Teaching Hours : 10hrs Marks: 12 (R-2, U-6, A-4)**

3	**Applications/ Examples of PLC** Process Diagram, logic, I/O listing, ladder diagram 3.1 Batch process Control 3.2 Diesel generator set control 3.3 Drum/Bottle Filling System 3.4 Traffic light control System **Course Outcome: CO2 Teaching Hours : 6 hrs Marks: 10 (R-2, U-2, A-6)**
4	**SCADA system** 4.1Introduction to SCADA 4.2Elements of SCADA: RTU, MTU, COMMUNICATION INTERFACE, HMI and working of SCADA 4.3Benefits of SCADA 4.4 Types of SCADA: Single master single remote, single master multiple control, multiple master multiple control 4.5 P and ID diagram introduction 4.6 Applications of SCADA system : Water distribution system, Batch process control 4.7 Mimic diagram ,program, device addressing, animation, alarm generation **Course Outcome: CO3 Teaching Hours : 8 hrs Marks: 12 (R-2, U-4, A-6)**
5	**PLC software** 5.1 Features of **PLC software** 5.2 Configuration of **PLC software** 5.3 Installing **PLC software** **Course Outcome: CO4 Teaching Hours : 3hrs Marks: 6 (R-2, U- , A-4)**
6	**Introduction to IoT** 6.1 Introduction to IoT 6.2 Benefits of IoT 6.3 IoT Hardware 6.4 IoT across various domains 6.5 Introduction to Raspberry Pi, Node MCU 6.6 IoT Application : Sensing the environment and Notifying **Course Outcome: CO5 Teaching Hours : 6 hrs Marks: 10 (R-2, U-4, A-4)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction to PLC**	2	6	2	10
2	**PLC Instructions**	2	6	4	12
3	**Applications/ Examples of PLC**	2	2	6	10
4	**SCADA system**	2	4	6	12
5	**PLC software**	2	-	4	6
6	**Introduction to IoT**	2	4	4	10
	Total	**12**	**22**	**26**	**60**

List of experiments: Total 12 experiments (or turns) out of 15 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Development of Basic logic functions AND gate, OR gate, NAND gate using ladder logic. Development of basic logic functions NOR gate, X-OR gate using ladder logic.(XIC,XIO,OTE Instruction)	4
2	2	CO2	Develop ladder diagram for Traffic control system and test it through PLC using TON instruction with timing diagram for all CTU/Ton/Toff/CTD/RTO	4
3	3,4	CO2, CO3	Temperature Control with given set-point using PLC. Develop ladder logic and graphics for SCADA applications	4
4	4	CO3	Create graphics display to test I/O Devices with SCADA system.	4
5	5	CO4	Configuration of PLC software	4
6	6	CO5	Control LED using RASPBERRY PI GPIO	4
7	2	CO2	Develop ladder diagram for Traffic control system and test it through PLC using TOFF instruction	4
8	2	CO2	Develop ladder diagram for Traffic control system and test it through PLC using RTO instruction	4
9	2	CO2	Develop the ladder program for counting the objects and test it with the PLC using CTU Instruction	4
10	2	CO2	Develop the ladder program for counting the objects and test it with the PLC using CTD Instruction	4
11	2	CO2	Develop Simple programs on maths instructions (ADD,SUB,	4

			MUL ,DIV) and Comparison instructions (EQU,NEQ,LES,LEQ, GRT,GERQ,LIM), test it	
12	4	CO3	Creation of analog, digital tags and addressing of these tags.	4
13	4	CO3	Creation and configuration of alarms for analog tags and digital tag.	4
14	3	CO2	Mini project based on PLC (e.g. Motor speed control, Automatic door implementation, Filling system based on PLC, Elevator system etc.)	4
15	5	CO3	Case study of any one SCADA application (e.g. Traffic signal control, water, waste water utilities and sewage, Railway traction etc.)	4
Total				**60**

Note: Experiments No. 1 to 5, 14 and 15 are compulsory and should map all units and Cos. Remaining experiments are to be performed as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Programmable controllers : Hardware, software and applications	George Batten, Jr., II Edition, New York : McGraw-Hill, 1994.	0070042144
2	Introduction to Programmable logic controllers	Gary Dunning, II Edition, Delmar Thomson Learning, 2001	0766817695, 9780766817692
3	SCADA: supervisory control and data acquisition	Stuart A. Boyer, II Edition, ISA, 1999	1556176600, 9781556176609
4	Programmable Logic Controller	V. R. Jadhav, III Edition, Khanna publishers, 2008	9788174092281
5	A course in Electrical and Electronic Measurements and Instrumentation	A.K.Sawhney, XI Edition, Rai, 1996	NA
6	Instrument Engineers' Handbook, Volume Two: Process Control and Optimization	Bela.G.Liptak, IV Edition, CRC Press, 2018	1420064002, 9781420064001
7	"Getting started with Internet of Things"	Cuno Pfister, I Edition, O'Reilly Media, 2011	978-1449393571, 9781449393571

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1. https://ndl.iitkgp.ac.in/
2. https://instrumentationforum.com
3. https://instrumentationtools.com
4. www.youtube.com
5. https://www.electronicshub.org

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	1	2	2	1
CO2	3	2	3	3	2	2	3	3	3	3
CO3	3	2	3	3	1	3	2	2	2	3
CO4	2	2	2	3	0	1	2	3	2	3
CO5	3	3	3	3	2	3	2	2	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Suvarna Salunke	Senior Controls Engineer	Vanderlande Industries Software Private Limited, Pune
2	Rushikesh Gawade	Director	Electroblazze Techno Solutions LLP
3	Shaktikumar Shiledar	Asst. Professor (Instrumentation)	Govt.College of Engg. Jalgaon
4	Anagha S. Aghav (Curriculum Content Designer)	Lecturer(Electronics Engineering)	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Electronics Engineering

Head of Department
Department of Electronics Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code:**EC19410**				Course Title: **VLSI**						
Compulsory / Optional: **Optional**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**4**	**--**	**7**	**--**	**--**	**--**		**50***	**50**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 and TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at mid-term and second skill test at the end of the term

Rationale:

The influence of integrated-circuit technology in the past few years on our society has been prevalent, in area ranging from consumer products to business management to manufacturing control. The driving force behind this pervasiveness is that the functional capability of modern integrated circuitry has increased in scope and complexity exponentially with time over the past 20 years. The designers of modern integrated circuitry have continually endeavored to provide more computational speed with less dissipated electrical power and less circuit board area, while maintaining a low failure rate and an aggressive cost. The complexity and speed is finding ready application for VLSI systems in digital processing. Although silicon MOS-based circuitry will meet most requirement in such systems. The student can acquire knowledge in the design skill of combinational and sequential circuit with the help of VHDL and NMOS and CMOS logic circuit processing operation; student can use this knowledge as technician, supervisor and programmer in different sections of industry.

Course Outcomes: Student should be able to

CO1	Implement logical equations using NMOS and CMOS technology.
CO2	Understand Hardware description language, its components and programming syntax.
CO3	Develop program to implement combinational and sequential logic circuit using VHDL.
CO4	Understand ASIC, FPGA and PLDs architecture.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to CMOS Technology** 1.1 Comparison of BJT, NMOS and CMOS parameters. 1.2 Design of basic gates using PMOS, NMOS and CMOS logic. 1.3 Drawing complex logic equations using CMOS logic. 1.4 Fabrication process:

	1.4.1 Overview of wafer processing. 1.4.2 Oxidation. 1.4.3 Epitaxy. 1.4.4 Deposition. 1.4.5 Ion-Implementation 1.4.6 Diffusion. 1.5 P-well, N-well and twin tub process for CMOS Logic. **Course Outcome: CO1** **Teaching Hours :12**
2	**Introduction to VHDL** 2.1 Introduction to HDL: History of VHDL, Pro's and Con's of VHDL. 2.2 VHDL Flow elements of VHDL (Entity, Architecture, Configuration, Package, Library Only definition). 2.3 Data types, Operators, Operations. 2.4 Signal Constant and variables (syntax and use). **Course Outcome:CO2** **Teaching Hours : 12**
3	**VHDL Programming** 3.1 HDL Front end design flow. 3.2 Concurrent constructs. 3.3 Simple VHDL program to implement combinational and Sequential Circuits such as MUX, DEMUX, ENCODER, DECODER, ALU, Flip Flop, Counter, shift register, MOORE, MEALY Machines. 3.4 Test bench and its applications. **Course Outcome:CO3** **Teaching Hours : 12**
4	**Introduction to ASIC, FPGA, CPLD Architecture.** 4.1 ASIC Design flow. 4.2 CPLD-Internal block diagram with explanation. 4.3 FPGA-Internal block diagram with explanation. 4.4 Comparison of ASIC, FPGA and CPLD. **Course Outcome: CO4** **Teaching Hours : 9**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to CMOS Technology.	12				
2	Introduction to VHDL.	12				
3	VHDL Programming.	12				
4	Introduction to ASIC, EPGA, PLD.	09				
	Total	**45**				

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

List of experiments: Total 12 experiments out of 15 experiments.

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,2.3	1,2.3	Design and simulate CMOS Basic gates using micro wind Tool. Write VHDL Program for logic Gates.	04
2	2.3.4	2.3.4	Write VHDL Program for Half and full-adder and subtractor and Synthesize using FPGA.	04
3	2.3.4	2.3.4	Write VHDL Program 8:1 Multiplexer, 1:8 Demultiplexer and Synthesize using FPGA.	04
4	2.3.4	2.3.4	Write VHDL Program 2:4 Decoder, 8:3 Encoder and Synthesize using FPGA.	04
5	2.3.4	2.3.4	Write VHDL Program for Synchronous Counter and Synthesize using FPGA. Write VHDL Program for Binary to Grey Code Converter and Synthesize using FPGA.	04
6	2.3.4	2.3.4	Write VHDL Program for Interfacing of ADC, DAC and Synthesize using FPGA.	04
7	2.3.4	2.3.4	Write VHDL Program for Implementing 4 bit ALU or sequence Generator and Synthesize using FPGA.	04
8	2.3.4	2.3.4	Write VHDL Program for Scrolling of data on seven segment display and Synthesize using FPGA.	04
9	2.3.4	2.3.4	Write VHDL Program for LCD controller and Synthesize using FPGA.	04
10	2.3.4	2.3.4	Microproject-8-BIT ALU Design. Phase-I. Project Initialization-Specification.	04
11	2.3.4	2.3.4	Microproject-8-BIT ALU Design. Phase-II. System analysis and design.	04
12	2.3.4	2.3.4	Microproject-8-BIT ALU Design. Phase-III. Rapid Proto typing-Testing (Manual testing) and evaluation.	04
13	2.3.4	2.3.4	Microproject-8-BIT ALU Design. Phase-IV. Implementation-Demonstration, deployment and Orientation.	04
14	2.3.4	2.3.4	Report writing ALU testing using test bench. Test bench is prepared to test 8-bit ALU and verify the result using test vector for various arithmetic and logical operations.	04
15	2.3.4	2.3.4	Report writing ALU testing using test bench. Collect the data and prepared the report.	04
Total				**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	VHDL Basics of Programming.	Gaganpreet Kaur, Pearson, 2011.	8131732118, 9788131732113
2	Digital Logic: Application and Design.	John M. Yarbrough, Cengage, 2006.	9788131500583

3	An Engineering Approach to Digital Design.	William I. Fletcher, Prentice-Hall of India, 2008.	8120306511, 9788120306516
4	Principals of CMOS VLSI Design: A System Perspective.	Neil H. E.Weste Kamran. Pearson Education, 2015.	9789332542884
5	VHDL Programming by Example.	Douglas Perry, Tata McGraw-Hill, 2002.	9780071409544
6	VISI Design and EDA Tools.	Angsuman Sarkar,Scitech Publication India Ltd.2011.	8183714528, 9788183714525

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2. https://www.udemy.com/course/vhdl-programming-with-intel-quartus-prime-tool/
3. https://www.intel.com/content/www/us/en/programmable/support/training/course/ohdl1110.html
4. https://www.youtube.com/watch?v=mwJ3uMWvJX0
5. https://www.youtube.com/watch?v=ht7nEjNydDU

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	3	3	1	2	2	3	3	2
CO2	2	2	3	3	1	2	2	2	3	3
CO3	2	3	3	3	1	2	2	3	3	3
CO4	2	3	2	2	1	2	2	2	2	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr Amol Sakhalkar	Director	Digel System.
2	Dr. J.H.Nirmal	H.O.D	K.J.Somaiya College of Engineering.
3	Mr. Anjum Mujawar	Sr. Lecturer	Vidyalankar Polytechnic.
4	Mr. Vivek Yograj Patil	Lecturer	Government Polytechnic, Mumbai.

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**									
Course Code: **EC19412**				Course Title: **Introduction to AI**					
Compulsory / Optional: **Optional**									
Teaching Scheme and Credits				Examination Scheme					
L	P	TU	Total	TH	TS	PR	OR	TW	Total
3	**4**	**--**	**7**	**--**	**--**	**--**	**50***	**50**	**100**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale: AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. The fields of AI such as Game Playing, Natural Language Processing, and Connectionist Models are also important. Student should know some programming language for AI.

Course Outcomes: Student should be able to

CO1	Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
CO2	Choose an appropriate problem solving method and knowledge representation scheme.
CO3	Analyze the problem (as a state space, graph, etc.) and select the appropriate search method.
CO4	Develop simple intelligent systems or classical toy problems using different AI techniques.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Overview of AI** 1.1 Introduction :Definition, Importance of AI , Difference between symbolic and non-Symbolic Representation. 1.2 History of AI-Turning Test, Chinese room. 1.3 Applications of AI. 1.4 Objective of AI. 1.5 Solving problems by searching. 1.6 Problem Formulation. **Course Outcome:CO1** **Teaching Hours:6**
2	**Intelligent Agents** 2.1 Structure of Intelligent agents. 2.2 Types of Agents. 2.3 Agent Environments PEAS representation for an Agent. **Course Outcome:CO1** **Teaching Hours:6**

3	**Search Techniques and Methods** 3.1 Uniform Search Technique-DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. 3.2 Informed Search Methods: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto Arithmetic Problem, Backtracking for CSP, Performance Evaluation. 3.3 Adversarial Search: Game Playing, Min-Max Search, Alpha Beta, Pruning. **Course Outcome:CO2** **Teaching Hours:12**
4	**Knowledge and Reasoning:** 4.1 A Knowledge Based Agent. 4.2 WUMPUS. 4.3 WORLD Environment. 4.4 Propositional Logic. 4.5 First Order Predicate Logic. 4.6 Forward and Backward Chaining. 4.7 Resolution. 4.8 Introduction to PROLOG. **Course Outcome: CO4** **Teaching Hours:6**
5	**Planning:** 5.1 Introduction to Planning. 5.2 Planning with State Space Search. 5.3 Partial Ordered planning, Hierarchical Planning. 5.4 Conditional Planning. 5.5 Planning with Operators. **Course Outcome: CO4** **Teaching Hours:6**
6	**Learning and AI algorithms:** 6.1 Learning from Observation. 6.2 General Model of Learning Agents. 6.3 Inductive Learning, Learning Decision Trees. 6.4 Rote Learning, Learning by Advice. 6.5 Learning in Problem Solving. 6.6 Explanation based Learning 6.7 Expert Systems: Representing and using Domain Knowledge, Expert System- shell, Explanation, Knowledge Acquisition 6.8 Introduction to AI algorithms-Linear and Logistic Regression, Decision tree. **Course Outcome: CO4** **Teaching Hours:9**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Overview of AI	6				
2	Intelligent Agents	6				
3	Search Techniques and Methods	12				

4	Knowledge and Reasoning:	6	
5	Planning	**6**	
6	Learning	**9**	
	Total	**45**	

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

List of experiments: Total 12 experiments out of 15 experiments.

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	3	2,3	Implementing Water jug problem using 1. BFS. , 2. DFS (Un-Informed Search)	04
2	3	2,3	Implementing 8 puzzle problems with Heuristic function using Hill Climbing. (Informed Search)	04
3	3	2,3	Implementing 8 puzzle problem with Heuristic function – Best First Search (Informed Search)	04
4	3	2,3	Implementing 8 Queen Problem with Heuristic function (Informed Search)	04
5	3	2,3	Implementing Tic-Tac-Toe problem to demonstrate Min – Max and Alpha Beta Pruning. (Adversarial Search)	04
6	4	4	Implementing WUMPUS world problem. (Knowledge and Reasoning)	04
7	4	4	Introduction to PROLOG – solving Basic problems like Factorial, Fibonacci series.	04
8	4	4	Implementing User Defined String functions etc. (PROLOG)	04
9	4	4	Implementing Family Information System (PROLOG)	04
10	4	4	Mini project-Implementing Mini Expert system. (PROLOG) Phase-I. Project Initialization-Specification.	04
11	4	4	Phase-II. System analysis and design.	04
12	4	4	Phase-III. Rapid Proto typing-Testing and evaluation.	04
13	4	4	Phase-IV. Implementation-Demonstration, deployment and Orientation.	04
14	1	1	Case studies of real artificial intelligence applications in business, including applications in marketing, finance, security, and other sectors. 1. Defining conceptual and theoretical structure. 2. Conduct pilot test and collect data. 3. Analyze the data.	04
15	1	1	4. Generate the report.	04
		Total		**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Introduction to Artificial Intelligence	Rajendra Akerkar, PHI Learning	978-81-203-4997-

		Pvt. Ltd,2014	1
2	Artificial Intelligence: A Modern Approach.	Stuart Russell, Peter Norvig, Pearson, 2016	1292153962, 9781292153964
3	AI-Structures and Strategies for Complex Problem Solving	George Lugar,Pearson,2011	0133001733, 9780133001730
4	Artificial Intelligence, 3rd edition	Patrick H. Winston, Pearson,1992	9788131715055
5	A First Course in Artificial Intelligence	Deepak Khemani, McGraw Hill Publication,2013	9781259029981 1259029981

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3. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_agents_and_environments.htm
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8. https://www.coursera.org/learn/introduction-to-ai
9. https://www.edx.org/professional-certificate/microsoft-artificial-intelligence

CO VsPO and CO Vs PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	2	2	2	2	2
CO2	2	3	3	3	2	3	1	2	3	3
CO3	2	3	3	3	2	3	1	2	3	3
CO4	2	3	3	3	1	3	2	3	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr Amol Sakhalkar	Director	Digel System, Mumbai
2	Dr. J.H.Nirmal	H.O.D	K.J.Somaiya College of Engineering.
3	Mr. Anjum Mujawar	Sr. Lecturer	Vidyalankar Polytechnic.
4	Mr. Vivek Yograj Patil	Lecturer	Government Polytechnic, Mumbai.

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

DEPARTMENT OF ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAMME

(SANDWICH PATTERN)

CURRICULUM DOCUMENT (REVISION 2019)

(Sixth Semester)

GOVERNMENT POLYTECHNIC MUMBAI

(An Autonomous Institute, Government of Maharashtra)

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme:Diploma in Electronics Engineering (Sandwich Pattern) **Term / Semester - VI**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
EC19306	In plant Training	0	40	0	40	20	0	0	0	0	100 *	100	200
	Total	0	40	0	40	20	0	0	0	0	100	100	200

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

***** Indicates assessment by External Examiner else internal practical skill test ,# indicates Self, on- line learning Mode, **@** indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator
Curriculum Development,
Department of Electronics

Head of Department
Department of Electronics,

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19307**				Course Title: **In plant Training**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
-	**40**	**-**	**40**	**-**	**-**	**-**	**-**	**100***	**100**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

We are in the era of skill development. Indian industrial sector is passing through highly competitive phased due to globalization. Cut throat competition is pre dominant and quality is one of the decisive factors for sustainability. Quality has become decisive factor in attracting students and faculty to an institution. The institution which offers quality education will survive in present scenario. Quality education cannot be complete without implant training.

In plant training provides an exposure to industry work culture, under the guidance of experienced persons, within the organization. The exposure will be provided in the following aspects of business: Technical and operations, Management, Personnel Policy, Finance, Marketing, Purchase, Legal and Social, etc. The mechanism of implant training will also provide an opportunity for industries to contribute in students overall development.

Course Outcomes: After the in plant training student should be able to

CO1	Gain first-hand experience of working as an engineering professional, including the technical application of engineering methods.
CO2	Develop technical, inter personal and communication skill.
CO3	Observe the functioning and organization of business /company.
CO4	Gain exposure to management programs and systems, effective administration method and compilation of information.

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3	3	2	3	3
CO2	2	1	1	2	2	2	3	1	1	1
CO3	1	-	-	1	2	1	1	-	1	-
CO4	1	1	2	2	2	3	2	-	1	-

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Amol Sakalkar	Director	Digisel Systems, Mumbai.
2	Prof. Anjum Mujawar	HOD, Electronics Engineering	Vidyalankar Polytechnic, Mumbai.
3	Prof. R. H. Gadyalji	HOD, Electronics Engineering	K. J. Somaiya Polytechnic, Mumbai.
4	Dr. H. M. Pardesi	Lecturer in Electronics Engineering	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

INPLANT TRAINING MANUAL

ELECTRONICS ENGINEERING DEPARTMENT

NAME OF STUDENT: _____

PROGRAMME: _____ ; SEMESTER/YEAR: _____

ENROLMENT No.:_____

CONTACT No.:_____

GOVERNMENT POLYTECHNIC, MUMBAI

(An Autonomous Institute of Government of Maharashtra)

49, Ali Yavar Jung Marg, Kherwadi, Bandra (East), Mumbai – 400 051
Website: www.gpmumbai.ac.in

GOVERNMENT POLYTECHNIC, MUMBAI

VISION:

Transform knowledge into work.

MISSION:

We are committed for

1. Quality education for lifelong learning.
2. Need based educational programmes through different modes.
3. Outcome based curriculum implementation.
4. Development & up gradation of standard laboratory practices.
5. Promoting entrepreneurial programmes.

We believe in equality, safety, environment friendly practices & teaching learning innovations.

GOVERNMENT POLYTECHNIC, MUMBAI

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principal@gpmumbai.ac.in,
Office Mail : office. gpmumbai@dtemaharashtra.gov.in

ELECTRONICS ENGINEERING DEPARTMENT

VISION:

Develop competent technician & practicing engineers in the field of electronics engineering.

MISSION:

To achieve our vision the department will update for continuous innovation, dedication to improve quality and provision of considerate facilities.

1. Deploying quality infrastructure & laboratory equipment.
2. Promote innovations in curriculum, teaching, learning & staff training.
3. Offering CEP & Community program.
4. Promoting Industry culture in work. Industry liasoning & enhancing employability.
5. Embracing changes & encouraging innovations in Electronics.

STUDENTS PERSONAL INFORMATION

- Student's Full Name:_____
- Programme:_____
- Class/Div:_____ Enrollment No.:_____
- Blood Group:_____ Date of Birth:_____
- Contact No.:_____
- Emergency Contact No.:_____

Recent Photograph

- Residential Address :_____

  _____

  _____
- Permanent Address :_____

  _____

  _____
- Parent Details:

1. Father's Name:_____

   Occupation:_____ Contact No.:_____

   Email Id:_____

   Office Address with Contact No.:_____

   _____
2. Mother's Name:_____

   Occupation:_____ Contact No.:_____

   Email Id:_____

   Office Address with Contact No.:_____

   _____

Name & Sign of the student Name & Sign of Father / Mother of student

INDEX

OVERVIEW:

Government Polytechnic Mumbai (GPM), established in 1960, is a leading institute in Mumbai region, and has been conferred with an academically autonomous status by the Government of Maharashtra. GPM has always remained at forefront to impart high quality technical education to the society, and continuously updated its curricula as per the technological changes with respect to time, to cater the needs of industries. To be the part of the mission 'Skill India', to achieve an academic excellence by exposing the students with latest technological developments occurring in various field and to enhance their professional skills, Government Polytechnic, Mumbai has uniquely introduced one complete semester's (Min. 20 weeks to 24 weeks) industrial training in curricula for the programme Electronics Engg. To implement the proposed inplant training successfully, training manual has been developed. The inplant training manual details the guidelines for students, faculty members, departments of the institute, industry persons at different levels, and other persons involved from academic organization as well as industries, for effective implementation of the inplant training during last semester of the various programmes. It provides practical advice about developing links with industry and setting up appropriate placement opportunities for students. Students will gain more from their placement, if properly prepared and advice is given about how they can be supported both before and during the placement. The manual highlights procedure/guidelines related to placement of the students to inplant training, selection of various training areas, documentation, guidelines for the students, daily and weekly diary formats, student and parent consent forms, monitoring and evaluation, report preparation and certification etc., essential for the successful completion of the inplant training.

INTRODUCTION

Indian industrial sector is passing through highly competitive phase due to globalization. Cut throat competition is predominant and quality is one of the decisive factors for sustainability. Quality has become a decisive factor in attracting students and faculty to an institution. The institutions which offer quality education will survive in present scenario. Industrial training is one of the essential curriculum requirements of every technical institute. Fresh young diploma students from the finest polytechnics are like uncut diamonds and look useless like trifles, give them proper training and they will dazzle forth in all their glory. In this context Government Polytechnic (Academically Autonomous Institute of Govt. of Maharashtra) has taken initiative and included inplant training for the programme like Electronics Engg. The intention of including the inplant training is to provide the exposure of actual industrial environment, industrial practices etc. to the students, and enrich their theoretical concepts, as well as practical skills to make them more employable. Industrial Training helps in increasing the knowledge and skill of a person for doing a particular job. Training enables acquisition of latest skills, and thus increases the versatility of the person for boosting his/her career. Appropriate training teaches proper operation, proper handling of equipment's and develops working confidence with whatever students have learnt. After completion of training, the students will feel much more confident about the field in which they have specialized. If some concepts remain unclear to the students during theoretical learning then at the time of interview, exams or in professional life, students may have to face many problems. Professional people always expect specific and accurate solution to every problem. Hence, inplant training will be very much useful to the students to clear some concepts, acquire different skills, get new ideas, and mainly to get introduced to the latest technological developments in various fields. Ultimately inplant training will be useful to enhance the professional life of the students in terms of various skills achieved, intelligence, sharpness, and mainly confidence.

2. PURPOSE OF INDUSTRIAL TRAINING

Industry training has been established to provide students with an overview of industries and to expose them to different aspects of a business, all under the guidance of skilled and experienced persons within the organization. This exposure should include all or most of the following aspects of business such as: management- and personnel policies, financial, marketing and purchasing functions, legal and social aspects, operations and technical activities. These goals can be achieved through the following forms of interaction:

- Introduction to the organizational policy and culture
- Organisation of the structure and hierarchy of ranks within the organization
- Liaison with employees at different levels.
- Liaison and cooperation with other engineering disciplines.
- Meaningful work programs or projects done from planning to completion and reporting.

3. OBJECTIVES OF INDUSTRIAL TRAINING

An ultimate objective of an Industrial Training is to make students ready for the employment in the specific discipline at the conclusion of the diploma course in specific branch of engineering. The programme wise knowledge will be enhanced by this opportunity, to relate academic and professional aspects of engineering disciplines. Various objectives of industrial training can be listed as:

- To gain hands-on experience of working as an engineering professional, including the technical application of engineering principles and methods.
- To work with other engineering professionals.
- To experience the work discipline in a professional organization.
- To develop technical, interpersonal and communication skills, both oral and written.
- To observe interactions of engineers with other professional groups.
- To study the structure of an organization and observe its functioning.

- To get the exposure of management programmes and systems, effective administration methods.
- To understand the process, drawings, techniques, methods etc., and compile it in documentation form.

4. PLANNING OF INPLANT TRAINING

The successful implementation of inplant training involves precise planning. The steps to be followed for its effective implementation are discussed below.

4.1 Planning for Inplant Training

- This step includes the collection of data from various sources such as BOAT, Confederation of Indian industry (CII), websites, of the prospective industries/offices for student's placement etc. The data includes the name of industry, addresses, contact persons, phone nos. and mail id of contact persons, type of business and product etc.
- These prospective industries are to be visited by TPO, HoD, and departmental faculties, etc. to collect the necessary information. This is continuous activity and data is updated regularly.
- Submission of an introductory letter/mail to industrial undertakings.
- Obtaining placements for the students,
- Issue of letters and completion of procedures,
- Assigning industries to departmental faculties for monitoring the inplant trainees.
- Orientation programme for students two weeks before reporting for inplant training.
- Monitoring inplant training (at least once in two weeks for each industry).
- Implementation and evaluation of inplant training

4.2 Placement Procedure

- Training can be done in one or more areas, such as, production, processing, maintenance service, construction, engineering and development, etc. Relevant information about different firms participating in training scheme

can be obtained from the following sources:

i. Library
ii. Respective Heads of Departments
iii. Training and Placement Officer and
iv. Websites, Apps etc.

- Eligible students can seek guidance from Head of Department, Faculty Members, and Training and Placement Officer for selection of firms.
- Students should give choice of firms in order of preference, to the Training and Placement Officer through concerned Head of Department (keeping in view facilities available and individual's interests).
- A student can also be placed in a new establishment, which has adequate training facilities if specific request for approval is made prior to the start of placement activities.
- Some companies conduct interview and select the candidates. The interviews may be conducted in industry premises or in our institute. Students will be given chance to appear for interview if they satisfy the minimum requirements laid down by the particular establishment. Once selected, no student will be allowed to appear for subsequent interviews with other establishments.
- Students will be placed at other available establishment depending upon the availability of seats, choice and merit. Students are required to be in touch with their department and finalize their placement.
- Once placed into a particular establishment, students are not allowed to change that establishment on any account. Factors like closeness to residence, stipend paid, etc. will have to be taken into account only at the beginning of training in the larger interest of the polytechnic.
- Approval/consent from the parent/ guardian, and student is required in prescribed form before the students are placed for Inplant Training. Students should collect all forms, letters for the company after submitting the approval.

- Report to the Personnel Manager/Officer or Training Manager/Officer or to the Officer who is in-charge of apprentices/training. In a small firm, this officer may be one of the Directors himself.

Students are required to:

- Fill in the Joining Report in duplicate and get it endorsed by the concerned Officials. Fill in the Joining Report, if any, of the organization also.
- Request the concerned officer to explain to you the rules, regulations and procedures of the organization and to take you around the plant so as to get an overview of the company's facilities, products, processes and organization.
- Get introduced to all the concerned persons of the organization. Request for a plan of "Training Program" for the students, if not prepared. The industry and Polytechnic Supervisors may jointly plan for training program.
- Submit all forms duly filled in to the Polytechnic Supervisor.

4.3 Inplant Training Program:

- Organizing a rigid and identical training program for each student in a discipline may not be practically possible. The training program has to be around facilities available in an individual unit and must fit in the philosophy and thinking of the training organization. Generally, medium and large scale industries have organized training departments. These industries are interested in absorbing the students later in their expansion programme, industries having one-off, batch and mass production activities, industries having a few processes and also industries which have sophistication.
- Some industries believe in 'on-the-job training', some take all six months to give the students understanding of products and processes in their complex, multi-plant organization, some give assignments, while others give meaningful projects and responsible tasks.
- Very important aspect is an understanding for meaningful training which fits in the framework of both our curriculum and organization's philosophy. Training programs have to be structured around the student, the curriculum,

facilities and the thinking about how to train. Every task provides an opportunity to learn through observations, doing, reading and discussion around the task/assignment/problem or project.

Students who are modest and inquisitive, who take initiative, keep their eyes, ears open and demonstrate better attitudes for learning gain most. one realizes what is right and what should be done. Exact repetition of tasks like copying or memorizing does not provide learning of skills or knowledge.

4.4 Monitoring of Inplant training

- Each department has organized and well-planned system for supervision of the students while they are in training. A faculty member is assigned to a group of students and firms.
- He / She visit each student once a fortnight on the average and maintains close liaison with his/her counterpart in the organization.
- In case of any problem or difficulty, students have to contact their Polytechnic supervisor and communicate the issue.
- All reports, records and project work are to be submitted through this polytechnic supervisor. Respective Heads of Department of concerned disciplines are in charge for satisfactory implementation of the scheme including placement, supervision, evaluation and related issues. Overall co-ordination of the programme is affected by Principal's Office and Training and Placement Officer.
- In case of strike/lockout or urgency, students should contact section in-charge of industry in which they are working, polytechnic supervisor, concerned Head of Department and Training and Placement Officer.

4.5 Daily and Weekly Diaries

Students are required to maintain the record of day-to-day work done in industry. Such records are called 'Daily Diaries'. The main purpose of writing daily and weekly diary is to nurture the habit of documenting and to encourage the students to search for details. It also cultivates the students' own thought process and

reasoning abilities. The students should record day to day account of the observations, processes, impressions and information gathered etc. in the daily training diary. It should contain the sketches, calculations, plannings, rough works, & drawings etc. related to the observations made by the students. The diaries are to be written regularly and records are to be maintained updated in diaries. The weekly diary has also to be maintained and it should contain the salient work performed in the particular week. All days for the week should be accounted for clearly giving attendance, absenteeism, leave, etc. The daily and weekly training diaries should be signed after every week from the supervisor/ incharge of the section in which the student has been working. The diary should also be produced to the polytechnic supervisor visiting the industry from time to time and get signed on the day of his visit.

4.6 Attendance Certification

Every week, students have to get their attendance certified by the training supervisor of the industry in the weekly diary. Regularity in attendance and submission/completion of reports will be duly considered while giving the term-work marks. The students may be allowed to take leaves as per rule of the industry/Government Polytechnic Mumbai. If, at any stage, the leaves are exceeded beyond the limit, the employer may take action such as stopping the payment of stipend or Principal may extend the training period in marginal cases. If the students remain absent for the considerable period, he/she may be detained for the semester as per the rules, ultimately training may be cancelled. In such cases, final decision taken by respective head of department and the Principal will be the final.

5. GUIDELINES FOR INDUSTRIAL TRAINING

It is mandatory for all the students of Electronics Engg to complete inplant training at an approved organization, during final year (sixth semester). The duration of training will be of minimum 20 weeks but not to exceed 24 weeks. Important aspects of inplant training can be highlighted as:

5.1 Role of Department

- Department have to send training request letter to various industries well in advance before commencement of training.
- After getting sufficient number of seats from the industries, students will be placed in different industries for inplant training.
- Students will have to fill up training form.
- Department will issue an order letter to industry for the said training mentioning the name and registration number of students.
- All above activities have to be carried out in advance of previous semester as plan out of placement in consultation with students. The students would normally be placed as per their choices, in case of more demand for a particular industry/service centre students would be allocated place based on their relative merit (based on declared last semester result)
- During the training period, the departmental supervisor in consultation with head of dept. will maintain a schedule for monitoring of industrial training and according to it he/she will monitor training of students in various industries.
- Visit industry/ follow up the students at training place at least once in every two weeks for evaluating student's activity and their progress.
- The institutional guide during the visit to industry will check the progress of the student in the training, his/ her attendance, discipline, presentation if any, and inplant training report preparation etc.
- Evaluate the daily diary, weekly diary, training reports etc. as a part of the term work assessment.
- Evaluate the students through presentation, viva at the end of the term as a part of term end assessment.

5.2 Role of Industry:

- Industry will give effective training to the students for improving their practical/professional skills.
- Industry is expected to assign group of the students under training to some middle management level person as on job industrial guide for supervision and guidance (industrial guide).
- Industrial supervisor has to assign the daily work to the students and monitor the students on daily basis. Industrial supervisor has also to sign the daily and weekly diaries also.
- Industry supervisor may allot some projects, assignments, tasks to an individuals or group of students under training. Those students who have been allotted such assignments, projects, etc. has to include a dedicated chapter about the task, problem solution methodology etc. in industrial training report.
- Industry supervisor should see that, the students are performing the given task under his/her supervision only.
- Industrial supervisor has to guide students for preparing the industrial training report. This report should not contain any confidential document /drawing/formula/specifications etc. of the industry. He should verify/certify training report from rules and regulation of industry related to confidentiality of the content.
- Industry is expected to maintain attendance of the students undergoing training and report any irregularity of the students to the concerned polytechnic supervisor, Head of Dept., or Training and placement officer.
- Industry is also expected to issue a certificate of attending training on their letter head with comments if any for student's record and motivation.

5.3 Guidelines for Students

- Students would interact with the identified faculty of the department to suggest his/her choices for suitable industry/service center.
- Students have to fill the forms, duly sealed and signed by authorities along with training order letter and submit it to training officer in the industry on the first day of training.
- Students must carry his/her Identity card issued by institute during training period.
- He/she will have to get the entire necessary information from the training officer regarding schedule of the training, rules and regulations of the industry. Student is expected to follow these rules, regulations, procedures etc obediently.
- During the training period students has to keep record of all the useful information in note book (daily diary) and maintain the daily, and weekly diary
- Prepare an industrial training report finally about the whole training for submitting to the department at the time of final presentation and viva.

5.3.1 Learning through placement

Industrial training provides an opportunity for students to develop new skills and attributes, to apply theoretical concepts they have learnt within their programme and to contextualize what they have learnt. Work-based learning is very different to traditional class-based learning in a number of ways:

- First, work-based learning is centered around reflection on work practices; it is not merely a question of acquiring knowledge and a set of technical skills [although these are important], but a case of reviewing and learning from experience.
- Secondly, work-based learning views learning as arising from action and problem-solving within a working environment, and this is centered on live projects and challenges to individuals and organizations. Work-based

learning also sees the creation of knowledge as a shared and collective activity, one in which people discuss ideas and share problems and solutions.

- Finally, work-based learning requires not only the acquisition of new knowledge but the acquisition of meta-competence – learning to learn.

The student should also focus on additional areas during Inplant Training

- Location and Description of industrial facility
- Company Profile
- Complete set of Technical datasheets covering the full range of products and/or services Proper specifications and technical procedures for performing all contracted and/or commissioned work
- Types of raw materials used, including unit prices, storage & procurement procedures
- Role of various departments in industries.
- Procedures used in manufacturing products and related equipment's.
- Learn and employ any software packages and/or tools which are employed in industries.
- Grievance handling procedures.
- Identify proper procedures for requesting and performing all types of changes.
- Identify any discrepancies between design and analysis methods covered in theory and practical considerations and procedures that might be employed in practice.
- Learn & practice industrial detailing procedures.
- Review all necessary steps for approval of design documents and/or drawings
- Review and practice necessary procedures for approving completed works.
- Identify proper procedures for creating bill of quantities.

- Review industrial safety procedures and whether these are properly implemented
- Review quality assurance regulations and procedures which are implemented in the facility.
- Material handling systems
- Preventive and breakdown maintenance procedure

5.3.2 Discipline:

Students are required to follow the rules and regulation of the organization. Their attitude and discipline should be exemplary. Students should remember that they are an ambassador of our institute when they are working as a trainee. Training of the students in future will depend upon the image created by the trainees. Hence, trainees must maintain good relations with the company authorities.

Students behavior may create positive or negative response and subsequent batches of students will be affected by the same. The following acts are highly undesirable by any of the students undergoing training and may result in severe punishment and cancellation of the term. Such instants have been observed and properly dealt with in the past. Students were punished for the same after proper investigation:

- Offending behavior with the supervisors, colleagues and workers.
- Refusal to work if a job / problem is given.
- Mixing with the workers and involving in labor union activities
- Threatening staff of the company and also instigating worker against staff and superiors.
- Not remaining on the job assigned.
- Grouping with other trainees and passing away time.
- Loitering outside, sitting in the canteen during working hours.
- Asking someone else to sign for him on the muster or punch his card.

5.3.3 Punctuality:

Students should be regular and punctual during complete training period. Students

must avoid the following:

- Late going to or coming early from the organization without permission or proper reason
- Taking leave without prior sanction from concerned person/s
- Habitual absenteeism
- Taking leave in excess of what is allowed.

If it becomes essential to take leave for the considerable period, due to unavoidable circumstances, contact with reasons to industrial supervisor, training supervisor from institute and Head of Department, prior going to leave.

5.3.4 Safety:

If you are safe, then only the question of further training comes. Students should not operate any machine without permission. He/she must familiarize with the job requirements/method/sequence of operation and safe practices. Students may be injured or may cause injuries to others or damage to the property. The following are some of the cases where our students met with accidents in the past:

- Finger cut on press operation
- Grinding wheel gave away while working
- Simultaneous operation by operator and trainee on Boring machine resulting in jamming and damage to machine.
- A machine was under erection and its limit switch was not adjusted. The trainee pressed the button resulting in damage to machine.
- Falling from false roof/ceiling while doing maintenance work.
- Palm crushed on injection moulding machine.

These are mentioned here so that students should be careful and avoid any type of hazards.

5.3.5 Access to Information

Companies need to maintain secrecy regarding their design/ product/process. Student should co-operate with the company in maintaining this secrecy. Student should not present any information/sketches/calculations, etc., of company without

prior permission of the officials. Student should attach therefore 'No Objection Certificate' from the company in industrial training report. No company would like such information to go to their competitors or any others. Proper identity regarding student/guardian background should be revealed to the company before start of the training so that later on problems do not arise.

5.3.6 Changeover to Other Company

Once placed in a company, no change is allowed during the training period. Students should not change the companies amongst theirself. Similarly, he/she should not join any company on his/her own. Students have to join the company where they are placed by the Polytechnic.

If students wish to take training in any company not on departmental list, he/she may apply to Training and placement officer / HoD and get a request letter. Specific approval of company has to be obtained well in advance. Training supervisor/ department head/TPO from the institute may then visit the company, or discuss with the company persons. If they are satisfied that adequate training facilities and staff are available, then only student will be placed in that factory.

Once the students are placed, change of the company will not be allowed on any account, and students are required to adopt to work situations. If students change the company by their own, training may not be approved and students may have to repeat the term.

5.3.7 Clarification of Training Semester

Students will surely gain when they will try to correlate theoretical concepts with practice. Every student must ensure that he/she has acquired some skills, gained experience, observed practices, visualized work situation, and thus learnt something. Students may have some doubts or queries about product process etc.

- Every student will see that all progress or work diaries are written, countersigned, and submitted to the polytechnic supervisor time to time.
- Student shall also ensure that inplant training report is completed, duly cleared by the company and duly signed by concerned supervisors.

6. TRAINING AREAS

The students may be the part of the project, small tasks, observe the procedures or collect the information pertaining to the following broad areas:

6.1 Electronics Engineering Areas

Following are some of the important areas of inplant training and supervisory work for Electronics Engineering students:

- PCB making and testing
- Microcontroller and Embedded systems
- Communication
- Automation
- Power Electronics
- VLSI
- Inventory Management and quality control and HR
- Software Development
- Public sectors Industries related to Electronics
- All Electronic equipment manufacturing and maintenance
- Project Planning and Management
- R & D

7. CURRICULA OF INPLANT TRAINING

Government Polytechnic Mumbai has been awarded an academic status by Govt. of Maharashtra vide government resolution, Higher and Technical Education, and Employment Dept. No. WBP-1093/(2640)(69)/VE-5, dated 30th May, 1994 to fulfill the demands of the industry as per the technological changes taking place in various fields of application. In this context, to monitor the overall functioning of the institute, various committees namely Governing Body, Board of Studies, Planning Committee, Evaluation Committee, Examination Committee, Appeal and Grievances Committee, and Purchase Committee were constituted under the autonomous institute by Govt. of Maharashtra vide government resolution, Higher and Technical Education, and Employment Dept. No. WBP-1093/(2640)(69)/VE-5, dated 31st May, 1994. As per the above referred resolution, Governing body is empowered to approve modifications in the present curriculum in order to meet the changed demands of the industry, society from time to time (Governing body- Function 7). In tune with the same, Board of Studies committee, is also empowered to prepare the syllabi of various courses, and develop curriculum, keeping in view the objectives of institute and the national requirement, provided syllabi shall be equivalent to the syllabi of Board of Technical Education (Board of Studies-function 1).

7.1 Electronics Engineering curriculum For Inplant Training

Programme : **Diploma in Electronics Engineering (Sandwich Pattern)**										
Course Code: **EC19307**				Course Title: **In plant Training**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
-	**40**	**-**	**40**	**-**	**-**	**-**	**-**	**100***	**100**	**200**

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

We are in the era of skill development. Indian industrial sector is passing through highly competitive phased due to globalization. Cut throat competition is pre dominant and quality is one of the decisive factors for sustainability. Quality has become decisive factor in attracting students and faculty to an institution. The institution which offers quality education will survive in present scenario. Quality education cannot be complete without implant training.

In plant training provides an exposure to industry work culture, under the guidance of experienced persons, within the organization. The exposure will be provided in the following aspects of business: Technical and operations, Management, Personnel Policy, Finance, Marketing, Purchase, Legal and Social, etc. The mechanism of implant training will also provide an opportunity for industries to contribute in students overall development.

Course Outcomes: After the in plant training student should be able to

CO1	Gain first-hand experience of working as an engineering professional, including the technical application of engineering methods.
CO2	Develop technical, inter personal and communication skill.
CO3	Observe the functioning and organization of business /company.
CO4	Gain exposure to management programs and systems, effective administration method and compilation of information.

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3	3	2	3	3
CO2	2	1	1	2	2	2	3	1	1	1
CO3	1	-	-	1	2	1	1	-	1	-
CO4	1	1	2	2	2	3	2	-	1	-

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Amol Sakalkar	Director	Digisel Systems, Mumbai.
2	Prof. Anjum Mujawar	HOD, Electronics Engineering	Vidyalankar Polytechnic, Mumbai.
3	Prof. R. H. Gadyalji	HOD, Electronics Engineering	K. J. Somaiya Polytechnic, Mumbai.
4	Dr. H. M. Pardeshi	Lecturer in Electronics Engineering	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

7.2 Term Work Evaluation

Regular monitoring of the students will be done by the polytechnic supervisors. Progress of the students will be monitored jointly by the supervisor from institute and industry. Polytechnic supervisors will take review of daily and weekly diary during every visit.

- Term work of the students will be evaluated jointly by the industry supervisor and polytechnic supervisors, based upon the performance of the students, work done by the student during the training.
- As a part of term work, industry supervisor will evaluate out of 50 marks, considering the following points

  i) Punctuality , ii) Discipline, iii) Learning initiatives, iv) Daily and weekly diary maintenance, and v) knowledge gained /skills achieved. Polytechnic supervisor will evaluate the students out of 50 marks considering the following points i) Punctuality , ii) Daily and weekly diary maintenance, iii) Learning initiatives, iv) Inplant training report writing, and v) knowledge gained /skills achieved.
- Total marks given by industry supervisor and polytechnic supervisor will be the total term work marks obtained by students during inplant training (outof 50+50=100). Respective department shall maintain the record of the same.

7.3 End Semester External Oral Examination

Evaluation of end semester external oral examination for 100 marks will be done jointly by the internal examiner from the respective department and external examiner, preferably from industries. Students should be evaluated based on presentation, knowledge gained and viva exam. The basic/core practical skills out of the total skills which students are supposed to have learnt during their industrial training should be examined. Various documents such as training report, daily and weekly diaries, special task work, projects, assignments etc. can be reviewed for the same.

Term work evaluation criteria for Inplant Training is as given below:

Term work evaluation for Inplant Training	
Name of Trainee	Mr/Ms…… ……..
Enrolment No.	……
Period of Training	From __ / __ / 20 To __ / __ / 20
Industry Name	…… ……

Term work evaluation by Industry supervisor

	Punctuality/ Discipline	Learning initiatives/ Attitude	Daily and weekly diary maintenance,	Inplant training report writing	Knowledge gained /skills achieved	Total marks
Max. Marks	5	5	5	5	5	25
Marks obtained						
Name and signature, and seal of Industry supervisor						

Term work evaluation by Polytechnic Supervisor

	Punctuality	Daily and weekly diary maintenance,	Learning initiatives taken,	Inplant training report writing	Knowledge gained and or skills achieved	Total marks
Max, Marks	5	5	5	5	5	25
Marks obtained						
Name, signature , and seal of Polytechnic supervisor						

- Viva (Oral exam.) evaluation criteria for Inplant Training is as given below:

Viva (Oral exam.) evaluation for Inplant Training	
Name of Trainee	Mr/Ms…… ……..
Enrolment No.	……
Period of Training	From __ / __ / 20 To __ / __ / 20
Industry Name	…… ……

Viva (Oral exam.) evaluation by Industry supervisor

	Ability to apply knowledge in practice	Leadership qualities	Interpersonal skills	Inculcation of safety attitude	Presentation & learning outcomes	Total marks
Max. Marks	5	5	5	5	5	25
Marks obtained						
Name and signature, and seal of Industry supervisor						

Viva (Oral exam.) evaluation by Polytechnic Supervisor

	Review of industrial assignments/ work done	Team skills	Industrial safety awareness	Correlation of theory and industrial practices	Presentation & learning outcomes	Total marks
Max, Marks	5	5	5	5	5	25
Marks obtained						
Name, signature , and seal of Polytechnic supervisor						

7.4 Suggested Work Load

Faculty members of the concerned department must visit periodically to the concerned industries to take follow up of the students during training for evaluating student's activity and their progress. The teaching load of 4 hrs per week may be considered for polytechnic supervisor for guiding and monitoring industrial trainees. Department has to prepare time table for the faculty members in such a way that the concerned teachers remain free for one complete day (may be different days for different teachers) in each week for industrial visits.

7.5 Inplant Training Report Format

It is essential to document the knowledge gained, skills achieved, activities performed, processes observed, and assignments completed during training period, etc. alongwith the brief information of section, department, and industry etc. in the form of industrial training report at the end of the training. The report is an important document for the reader who may be a technical or non-technical person, an expert and a third person not concerned with the training. The report should consist of major headings, results, conclusions and comments. Brief information of an industry, process performed, details of equipment's used, procedure followed, observations, calculations etc. must be included in this report. Statistical & data tables necessary but not essential can be placed in the appendix. The report should be written in such a way that a student should be able to refer the same in future. The report must reflect everything new the student has come across in the industry thus enlarging his horizon. Students may visit websites as their learning tool during industrial training. Such sources of learning like videos, animations are required for preparation of PPT, as well as literature for project report during the training period.

7.5.1 Page Specifications

The training report should be prepared with the following specification

Paper size : A4

Left Margin : 3.5 cm

Right Margin : 3.0 cm
Top Margin : 2.54 cm / 1 inch
Bottom Margin : 2.54 cm / 1 inch
Heading – Font Size: 14, Bold, Times New Roman.
Normally Body Text – Font Size: 12, Times New Roman, 1.5 Spacing, Paragraph
Section Heading and Subsection Heading – Font Size: 12, Bold, Times New Roman.
Page numbers – All text pages as well as program source code listings should be numbered using numerals at the bottom center of the pages.

7.5.2 Outline of Report

- Training report must have a formal title page.
- Report should include various certificates namely training completion certificate, No objection certificate etc. signed by the concerned authorities.
- Report must have preface at the beginning, stating the purpose of the report, sources of the information and the authority under which the work is conducted.
- The acknowledgement page follows the preface. The trainee has to express their gratitude where they underwent training, sponsor of the programme, industrial persons, polytechnic supervisor, Head of department, TPO, Principal, and other concerned.
- Table of contents or index.
- List of tables and list of figures
- Abstract- an abstract should summarize the outcomes of an inplant training such as knowledge gained, skills achieved, special task performed if any, etc. during the complete training period, in one or two paragraphs.

Report should be divided into chapters or sections, major headings depending on the area and the size of operations. Each chapter may include organizational details of the particular industry, section wise report, learning experiences etc.

Chapter I	Introduction of the Industry, Location, Turn over, Man power, Technical, non-technical Skilled personnel, products and marketing strategies etc.
Chapter II	Organizational structure – hierarchy, administration chart, communication system and Categories of communication between personnel and department etc.
Chapter III	Department/Section wise report: Description of the department/ Section/Shop, the processes and procedures followed in it. Equipment's in the department, special attachment, indigenously adopted tools, learning experience, work culture, materials, safety, drawings, sketches, specification of equipment, should be given wherever essential. Incentives for production, quality control and problem solving strategies. Roll of the engineers, personnel & any other human resource features should be highlighted.
Chapter IV	Industry based learning materials collected : - photographs, charts, diagrams, pictures, Specifications, research papers, technical etc
Chapter V	Detail report on the specialised work, task, project, assignments, etc., undertaken during inplant training.
Chapter VI	Conclusions should include overall learning outcome in form of gain in the area of technical knowledge, behaviour changes, personal gains etc. from inplant training.
Chapter VII	Industrial authority based Suggestions for curriculum Modification: if perceived, changes in the curriculum could be Suggested which may include new technology, new techniques, obsolete techniques etc. With proper justification best on observation/ experience during training and in consultation with the higher authority from industries. The student should perceive the curriculum Modification with the higher authority from industries with the copy of institute curriculum.
Bibliography	Bibliography includes the references which are referred for completion of inplant training report. The references includes the books, magazines, websites, video, research papers published etc.

Appendix:	This section could contain essential charts, diagram, tables, photographs, drawings, etc. necessary but not essential in the main frame of the report but must be referred to in the main report. Plant lay out and descriptions of the apparatus may be supported with well labelled diagrams rather than descriptions. Except for the suggestions & recommendations report must be written in past tense and first person.

8. LETTERS, FORMATS AND CERTIFICATES

This section includes various letters, formats, and certificates required to be filled, signed, and certified by the concerned authorities for the successful competition of the Inplant Training

GOVERNMENT POLYTECHNIC, MUMBAI

(An Academically Autonomous Institute of Govt. of Maharashtra)
49, Kherwadi, Aliyawar Jung Road, Bandra (E), Mumbai-400051
Phone: 9029001925, **Website: www.gpmumbai.ac.in**
Email: gpmumbai@gpmumbai.ac.in,
Principal Mail: principal.gpmumbai@dtemaharashtra.gov.in
principal@gpmumbai.ac.in,
Office Mail : office. gpmumbai@dtemaharashtra.gov.in

`

Date:

To,

_____

SUB: INPLANT TRAINING

Sir/Madam,

As a part of prescribed curriculum of Electronics Engg., your son/daughter/ward ……, Enrolment no. ……, has to undergo 20 to 24 weeks of Inplant training in industry during even term of the final year. He/she is being placed at …… ……..…..(name and address of company, for inplant training from date …… to …….

In this regard, I wish you to be acquainted with certain rules/regulations/aspects of inplant training as detailed in students/parents consent letter attached herewith.

You are requested to go through the parents consent letter carefully and return to me duly signed.

Thanking you

Head of Dept.
Electronics Engg

Govt. Poly. Mumbai

STUDENT'S CONSENT LETTER*

Date: / /

To,
The Principal,
Government Polytechnic, Mumbai
Kherwadi, Bandra (E),
Mumbai - 400 051.

Sub. : Inplant Training Consent

I undersigned Kumar/Ms…… Enrol. No..……., presently studying in Third/ Second year Electronics Engg. I am aware that during this semester myself is being placed in …….(name of the company) for inplant training as part of the Diploma programme in Electronics Engg.

I am also aware that:

1. I will submit a joining report in the prescribed form, duly countersigned by the Officer of the Organization where I will be working as inplant trainee.
2. I will entirely under the disciplinary control of the organization where I will be placed, and will abide by the rules and regulations in force of the said organization.
3. I will make aware of the safety rules, and regulations of the concerned industry in a first week of the training itself. I will not start/operate any machine, process, operations, work, etc. which may cause injury to me, others, an accident, or property loss etc. without permission and under the observations of the concerned supervisors
4. I will always work under the supervision of the industry supervisor allotted to me. In case, I do not follow the safety rules and regulations of the organization where I am placed for inplant training, and some injury/accident takes place to me or others, myself will be responsible for it. In such cases, Government polytechnic Mumbai or concerned industry will not be responsible for it.
5. I am also aware that I will maintain the confidentiality of the industrial documents, formulas, processes, sequences, drawings, methods etc. If knowingly or unknowingly I am disclosing such documents, and industry suffers financial loss or any other kind of

loss/defame, I will be responsible for it. No other persons like polytechnic supervisor or industry supervisor will be responsible for it.

6. I am also aware that if any property loss, injury occurs to me or others, because of my negligence, concerned organization as well as Govt. Polytechnic, Mumbai will not be responsible for it.
7. During training period, I will be entitled to the leave as per the rules laid down by the Polytechnic as well as concerned organization in this behalf. In case I need leave in unavoidable circumstances, I will get the leave sanctioned by the organization and my training supervisors.
8. I will maintain the prescribed daily diary, weekly diary etc. regularly and also get it countersigned by the concerned officer of the organization as well as training supervisor of the Polytechnic.
9. Inplant Training will be granted only if myself attends industry on all working days, completes minimum 20 weeks, maintains good progress, and undergoes the training to the satisfaction of the authorities of the Polytechnic and the Industry,
10. During the tenure of inplant training period, myself may or may not get the stipend. Also the expenses such as travelling expenses, food charge etc. will be done by me.
11. Once myself joins the specific organization for inplant training, I will not change/interchange the organization in any circumstance by my/our own, without informing the concerned authorities
12. After start of the inplant training, I will follow the stipulated training programme. If I do not complete the inplant training of minimum period, academic term of inplant training i.e. last semester may not be considered. In such a case I will have to complete the minimum period or repeat the complete term as decided by the concerned head of the department.

Yours faithfully,

Date:

Place:

Name and Sign of student with Enrl. No

*** Note: This copy should be submitted to the concerned Department**

STUDENT'S CONSENT LETTER*

Date: / /

To,
The Principal,
Government Polytechnic, Mumbai
Kherwadi, Bandra (E),
Mumbai - 400 051.

Sub. : Inplant Training Consent

I undersigned Kumar/Ms…… Enrol. No..……., presently studying in Third/ Second year Electronics Engg. I am aware that during this semester myself is being placed in …….(name of the company) for inplant training as part of the Diploma programme in Mech. Engg./ Civil Engg./ Rubber Technology/ Leather Technology/ Leather Goods & Footwear Technology.

I am also aware that:

1. I will submit a joining report in the prescribed form, duly countersigned by the Officer of the Organization where I will be working as inplant trainee.
2. I will entirely under the disciplinary control of the organization where I will be placed, and will abide by the rules and regulations in force of the said organization.
3. I will make aware of the safety rules, and regulations of the concerned industry in a first week of the training itself. I will not start/operate any machine, process, operations, work, etc. which may cause injury to me, others, an accident, or property loss etc. without permission and under the observations of the concerned supervisors
4. I will always work under the supervision of the industry supervisor allotted to me. In case, I do not follow the safety rules and regulations of the organization where I am placed for inplant training, and some injury/accident takes place to me or others, myself will be responsible for it. In such cases, Government polytechnic Mumbai or concerned industry will not be responsible for it.
5. I am also aware that I will maintain the confidentiality of the industrial documents, formulas, processes, sequences, drawings, methods etc. If knowingly or unknowingly I am disclosing such documents, and industry suffers financial loss or any other kind of

loss/defame, I will be responsible for it. No other persons like polytechnic supervisor or industry supervisor will be responsible for it.

6. I am also aware that if any property loss, injury occurs to me or others, because of my negligence, concerned organization as well as Govt. Polytechnic, Mumbai will not be responsible for it.
7. During training period, I will be entitled to the leave as per the rules laid down by the Polytechnic as well as concerned organization in this behalf. In case I need leave in unavoidable circumstances, I will get the leave sanctioned by the organization and my training supervisors.
8. I will maintain the prescribed daily diary, weekly diary etc. regularly and also get it countersigned by the concerned officer of the organization as well as training supervisor of the Polytechnic.
9. Inplant Training will be granted only if myself attends industry on all working days, completes minimum 20 weeks, maintains good progress, and undergoes the training to the satisfaction of the authorities of the Polytechnic and the Industry,
10. During the tenure of inplant training period, myself may or may not get the stipend. Also the expenses such as travelling expenses, food charge etc. will be done by me.
11. Once myself joins the specific organization for inplant training, I will not change/interchange the organization in any circumstance by my/our own, without informing the concerned authorities
12. After start of the inplant training, I will follow the stipulated training programme. If I do not complete the inplant training of minimum period, academic term of inplant training i.e. last semester may not be considered. In such a case I will have to complete the minimum period or repeat the complete term as decided by the concerned head of the department.

Yours faithfully,

Date:

Place:

Name and Sign of student with Enrl. No

*** Note: This copy should be retained in this report for information.**

PARENT/GUARDIAN CONSENT LETTER*

Date: / /

To,

The Principal,
Government Polytechnic, Mumbai
Kherwadi, Bandra (E),
Mumbai - 400 051.

Sub. : Inplant Training Consent

I undersigned Mr./Mrs…… aware that my son /daughter/ward Master/Ms. ……, Enrol. No..…… is studying in Third/Second year (Sixth/Fourth Semester) Electronics Engg in your Polytechnic. During this semester he/she is being placed in ……..……
(name of the company) for inplant training as part of the Diploma programme in Electronics Engg.

I am also aware that:

1. My son/daughter/ward will submit a joining report in the prescribed form, duly countersigned by the Officer of the Organization where he/she will be working.
2. My son/daughter/ward will be entirely under the disciplinary control of the organization where he / she will be placed, and he/she will abide by the rules and regulations in force of the said organization.
3. My son/daughter/ward will make aware of the various safety rules and regulations of the industry in the first week of the training.
4. My son/daughter/ward will always work under the supervision of the industry supervisor allotted to him/her. I am also aware that he/she will maintain the confidentiality of the industrial documents, formulas, processes, sequences, drawings, methods etc. If knowingly or unknowingly he/she is disclosing such documents, and industry suffers financial loss or any other kind of loss he/she will be responsible for it. No other persons like polytechnic supervisor or industry supervisor will be responsible for it.
5. I am also aware that during entire training period, if my son/daughter/ward is not following the safety rules, and regulations laid by the concerned organization, and if any injury /accident occur to him/her, only he/she will be responsible. Organization as well as Govt. Polytechnic Mumbai will not be responsible for such causes.
6. I am also aware that if any property loss, injury to him/her or others, an accident etc. occurs during the training period because of the negligence of my son/daughter/ward,

concerned organization as well as Govt. Polytechnic, Mumbai will not be responsible for it.

7. During training period, my son/daughter/ward is entitled to the leave as per the rules laid down by the Polytechnic as well as concerned organization in this behalf. In case he/she needs leave in unavoidable circumstances, he/she should get the leave sanctioned by the organization and his/her Training Supervisor.
8. My son/daughter/ward will maintain the prescribed daily diary, weekly diary etc. regularly and also get it countersigned by the concerned officer of the organization as well as training supervisor of the Polytechnic.
9. Inplant Training will be granted to my son/daughter/ward only if he/she attends his/her organization on all working days, completes minimum 20 weeks, maintains good progress, and undergoes the training to the satisfaction of the authorities of the Polytechnic and the organization of his/her inplant training.
10. During the tenure of inplant training period, my son/daughter/ward may or may not get the stipend. Also the expenses such as travelling expenses, food charge etc. will be done by him/her.
11. Once my son/daughter/ward joins the specific organization for inplant training, he/she will not change/interchange the organization in any circumstance by his/her own, without informing the concerned authorities
12. Once my son/daughter/ ward starts his/her inplant training, he/she will follow the stipulated training programme. If he/she do not complete the inplant training of minimum period, his /her academic term of inplant training i.e. last semester may not be considered. In such a case he/she has to complete the minimum period or repeat the complete term as decided by the concerned head of the department.
13. I have explained all above contents to my son/daughter/ward, who has promised to adhere strictly to the rules and regulations of the industry as well as Government polytechnic Mumbai.

Yours faithfully,

Date:
Place:

Name and Sign of father/mother/ guardian

*** Note: This copy should be submitted to the concerned Department.**

PARENT/GUARDIAN CONSENT LETTER*

Date: / /

To,

The Principal,
Government Polytechnic, Mumbai
Kherwadi, Bandra (E),
Mumbai - 400 051.

Sub. : Inplant Training Consent

I undersigned Mr./Mrs…… aware that my son /daughter/ward Master/Ms. ……, Enrol. No..……. is studying in Third/Second year (Sixth/Fourth Semester) Electronics Engg in your Polytechnic. During this semester he/she is being placed in ……..……
(name of the company) for inplant training as part of the Diploma programme in Electronics Engg

I am also aware that:

1. My son/daughter/ward will submit a joining report in the prescribed form, duly countersigned by the Officer of the Organization where he/she will be working.
2. My son/daughter/ward will be entirely under the disciplinary control of the organization where he / she will be placed, and he/she will abide by the rules and regulations in force of the said organization.
3. My son/daughter/ward will make aware of the various safety rules and regulations of the industry in the first week of the training.
4. My son/daughter/ward will always work under the supervision of the industry supervisor allotted to him/her. I am also aware that he/she will maintain the confidentiality of the industrial documents, formulas, processes, sequences, drawings, methods etc. If knowingly or unknowingly he/she is disclosing such documents, and industry suffers financial loss or any other kind of loss he/she will be responsible for it. No other persons like polytechnic supervisor or industry supervisor will be responsible for it.
5. I am also aware that during entire training period, if my son/daughter/ward is not following the safety rules, and regulations laid by the concerned organization, and if any injury /accident occur to him/her, only he/she will be responsible. Organization as well as Govt. Polytechnic Mumbai will not be responsible for such causes.
6. I am also aware that if any property loss, injury to him/her or others, an accident etc. occurs during the training period because of the negligence of my son/daughter/ward,

concerned organization as well as Govt. Polytechnic, Mumbai will not be responsible for it.

7. During training period, my son/daughter/ward is entitled to the leave as per the rules laid down by the Polytechnic as well as concerned organization in this behalf. In case he/she needs leave in unavoidable circumstances, he/she should get the leave sanctioned by the organization and his/her Training Supervisor.
8. My son/daughter/ward will maintain the prescribed daily diary, weekly diary etc. regularly and also get it countersigned by the concerned officer of the organization as well as training supervisor of the Polytechnic.
9. Inplant Training will be granted to my son/daughter/ward only if he/she attends his/her organization on all working days, completes minimum 20 weeks, maintains good progress, and undergoes the training to the satisfaction of the authorities of the Polytechnic and the organization of his/her inplant training.
10. During the tenure of inplant training period, my son/daughter/ward may or may not get the stipend. Also the expenses such as travelling expenses, food charge etc. will be done by him/her.
11. Once my son/daughter/ward joins the specific organization for inplant training, he/she will not change/interchange the organization in any circumstance by his/her own, without informing the concerned authorities
12. Once my son/daughter/ ward starts his/her inplant training, he/she will follow the stipulated training programme. If he/she do not complete the inplant training of minimum period, his /her academic term of inplant training i.e. last semester may not be considered. In such a case he/she has to complete the minimum period or repeat the complete term as decided by the concerned head of the department.
13. I have explained all above contents to my son/daughter/ward, who has promised to adhere strictly to the rules and regulations of the industry as well as Government polytechnic Mumbai.

Yours faithfully,

Date:
Place:

Name and Sign of father/mother/ guardian

*** Note: This copy should be retained in this report for information.**

JOINING LETTER

Date:… / … /20….

To,

…….
…….
…….
…….

Subject: Permission for joining the Inplant training at your organization

Reference: ……..

Respected Sir,

With reference to above subject, myself Mr./Ms ……..…… ……, student of Govt. Polytechnic Mumbai,Final year EC Enrolment number……., reporting for joining the Inplant Training at your organization on …… (date).

I assure that, during complete training period, I will follow the rules and regulation of your organization.

You are kindly requested to permit me to join the Inplant training.

Thanking you.

Yours obediently

(Signature of Student)

JOINING REPORT*

Date:… / … /20….

To,

The Principal,
Government Polytechinc, Mumbai,
Kherwadi, Bandra (E),
Mumbai 400 051.

Subject: Joining report for the Inplant training

Reference: ……

Respected Madam / Sir,

With reference to above subject, myself Mr./Ms ……..…… ……, student of Govt. Polytechnic Mumbai, Third /second year EC, Enrolment number……., joined for the Inplant Training at …… (name of organization) on …… (date).

I assure that, during complete training period, I will follow the rules and regulation of the said organization.

Thanking you.

Yours obediently

(Signature of Student)

Signature of the Officer (Industry)
Seal of the Organization

* This copy should be retained in this report for information.

JOINING REPORT*

Date:… / … /20….

To,

The Principal,
Government Polytechinc, Mumbai,
Kherwadi, Bandra (E),
Mumbai 400 051.

Subject: Joining report for the Inplant training

Reference: ……

Respected Madam / Sir,

With reference to above subject, myself Mr./Ms ……..…… ……, student of Govt. Polytechnic Mumbai, Third /second year EC Enrolment number……., joined for the Inplant Training at …… (name of organization) on …… (date).

I assure that, during complete training period, I will follow the rules and regulation of the said organization.

Thanking you.

Yours obediently

(Signature of Student)

Signature of the Officer (Industry)
Seal of the Organization

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* This copy should be submitted to the concerned Head of Department

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GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
1				Present = Absent = Leave =
2				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
3				Present = Absent = Leave =
4				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
5				Present = Absent = Leave =
6				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
7				Present = Absent = Leave =
8				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
9				Present = Absent = Leave =
10				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
11				Present = Absent = Leave =
12				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
13				Present = Absent = Leave =
14				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
15				Present = Absent = Leave =
16				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
17				Present = Absent = Leave =
18				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
19				Present = Absent = Leave =
20				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
21				Present = Absent = Leave =
22				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
23				Present = Absent = Leave =
24				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Weekly Report of Inplant Training

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

_____

Week No.	Date		Brief weekly report of the work done/observation made	Attendance No. of days
	From	To		
				Present = Absent = Leave =
				Present = Absent = Leave =

Students Signature:

Dated Signature of Industry Supervisor

Dated Signature of Polytechnic Supervisor

GOVERNMENT POLYTECHNIC, MUMBAI

49, Kherwadi, Ali Yawar Jung Marg, Bandra (E), Mumbai-51

Daily Report of Inplant Training *

Name of the Student _____ Enrollment No:_____

Programme:._____ _____Dept./Plant/Section:_____

Company name & address_____

Week No.	**Day and Date**	**Brief report of the work done/observation made etc. in a day**

Sign of the student

(* This is the format of daily report maintained by the student during training period. Students shall make separate 200 pages notebook as a daily diary, and maintain the records/observations / work/report etc. done on a particular day as per the above format.

Student shall carry this diary with them regularly during training period, and maintain the records in it. Also get this diary signed by the industry supervisor as well as polytechnic supervisor periodically. The information from this diary may be useful while writing the weekly diary, and inplant training report, examinations etc.)

INDUSTRIAL TRAINING COMPLETION CERTIFICATE

This is to certify that the below student has successfully completed the Inplant Training of …… weeks at our organization …… …… …… (name and address of organization).

Name of the student: ……

Programme and Year : Third/ Second Year Electronics Engg

Enrolment No. : ……

Training start date: ……

Training completion date: ……..

During the complete training period, the his/her performance and conduct was good.

Name and Sign.
Section/ Industry Supervisor

Name and Sign.
Date: Head of Section/ Plant/ Officer (Industry)
Seal of the Organization

INDUSTRIAL TRAINING COMPLETION CERTIFICATE

This is to certify that Mr./Ms……., Enrolment No……..,Third/Second year student of Electronics Engg, from Government Polytechnic, Mumbai has successfully completed the Inplant Training of ……weeks at our organization …… ……(name and address of organization).

Training start Date: ……

Training completion date: ……..

The performance and conduct of the above student was good during the complete training period.

Name and Sign.
Section/ Industry Supervisor

Name and Sign.
Date: Head of Section/ Plant/ Officer (Industry)
Seal of the Organization

***Note:** Two copies of this certificate are to be printed on the letterhead of the industry. One copy will be included in the industrial training report, and one copy will retained with the student.

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NO OBJECTION CERTIFICATE

This is to certify that Mr./Ms……., Enrolment No……..,Third/Second year student Electronics Engg from Government Polytechnic, Mumbai has successfully completed the Inplant Training of …… weeks at our organization …… ……(name and address of organization) from …… (start date of training) to …… (completion date of training).

This report does not contain any confidential document of the company such as design, drawing, formula, specifications, documents, procedures, etc., which may cause any type of loss to this company.

Name and Sign.
Section/ Industry Supervisor

Name and Sign.
Date: Head of Section/ Plant/ Officer (Industry)
Seal of the Organization

***Note:** Student should take the printout of this certificate on the letterhead of the industry, and include in the industrial training report.

FEEDBACK FORM

A. Feedback about the student

(Name of student……..

Enrolment No.:……)

During complete training period,

i. Student performance and conduct was … Good/Average/poor

ii. Student was found to be good at …….

iii. Improvement of the student is desired in …….

iv. Students willingness to learn new things…….. … Good/Average/poor

v. Any other points……

……

……

……

B. Overall Feedback

i. Subjects/topics which you fill to be included in the new curriculum

……

……

……

ii. Areas that needs further improvement

……

……

iii. Suggestion for the modification of existing curriculum

……

……

iv. Any other points

……..

……

Name and Sign.

Date: Industry Supervisor/ Section / Plant/ Officer (Industry)

OUTCOMES OF THE INPLANT TRAINING COURSE

- To experience work discipline in professional organization.
- To work with engineering professionals.
- To develop technical, interpersonal and communication skills.
- To gain the experience of technical application of engineering methods.
- To observe the functioning of departments, organization.
- To get exposure to administrative methods.
- To acquire the skill of data collection, and report compilation.

WHEN YOU ARE IN INPLANT TRAINING

T - To be in **T**ime
R - Remain attentive all the time
A - **A**ctively participate
I - Interact for clarity
N - Note the important points
I - **I**mprove listening habits
N - **N**ever neglect the safety
G - **G**ain as much as you can

GOVERNMENT POLYTECHNIC, MUMBAI

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PROGRAMMES

CIVIL ENGINEERING
FIRST SHIFT - 60 (Intake)
SECOND SHIFT - 60 (Intake)

MECHANICAL ENGINEERING
FIRST SHIFT - 60 (Intake)
SECOND SHIFT - 60 (Intake)

ELECTRICAL ENGINEERING
FIRST SHIFT - 60 (Intake)

COMPUTER ENGINEERING
FIRST SHIFT - 60 (Intake)
SECOND SHIFT - 60 (Intake)

ELECTRONICS ENGINEERING
FIRST SHIFT - 60 (Intake)
SECOND SHIFT - 60 (Intake)

INFORMATION TECHNOLOGY
FIRST SHIFT - 60 (Intake)
SECOND SHIFT - 60 (Intake)

INSTRUMENTATION ENGINEERING
FIRST SHIFT - 60 (Intake)

RUBBER TECHNOLOGY
FIRST SHIFT - 30 (Intake)

LEATHER GOODS & FOOTWEAR TECHNOLOGY
FIRST SHIFT - 15 (Intake)

LEATHER TECHNOLOGY
FIRST SHIFT - 15 (Intake)