Government PolytechnicMumbai

(Academically Autonomous Institute of Govt. of Maharashtra)

Department of Information Technology

P-19 Curriculum

(Sandwich Pattern + Out Come Based)

Index for Curriculum Document of P19

Department of Information Technology

1. **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 equality, safety, environment friendly practices and teaching learning innovations.

2. **Vision of the Department:**
   Develop IT professionals to solve real life problems.

   Mission of the Department:

   Information technology department is committed to

- Offer need based quality education for lifelong learning
- Continuous up gradation of curriculum and laboratories through industry institute interaction.
- Conduct short term programmes to serve society.
- Develop entrepreneurial capabilities.
- Imbibe social awareness and responsibility in students to serve the society and protect environment
- Make the students industry ready to enhance their employability in the industries.

3. **Programme Outcomes (POs):**

   PO1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
   PO2. Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.
   PO3. 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.
   PO4. Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
   PO5. Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6. 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.

PO7. Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological changes.

4. Programme Specific Outcomes (PSOs)

PSO1. The student should do programming, database management, networking, web design, Information Security, Cyber Security and recognize the need for independent and lifelong learning in the era of fast changing Information technology.

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PSO2. The Student should apply knowledge to solve problems through tools with understanding of social, ethical and environmental context.

PSO3. The student should Analyze Computing problems and fined solutions as an individual and can work in a team as a member or team leader.

5. Program me Educational Objectives (PEOs):

PEO1. Exhibit professionalism, ethical attitude, communication skills, team work in their profession to provide economically feasible and socially acceptable solutions to real life problems.

PEO2. Update professional abilities by engaging in lifelong learning.

PEO3. Adapt state-of-the-art Information Technology broad-based techniques to work in multi-disciplinary work environments.

Government Polytechnic Mumbai

Curriculum Philosophy

(P19 Outcome based Curriculum)

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 cope with 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 Implant 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 implant 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 MOOC in 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 considering evolving 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 the knowledge 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 knowing what 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

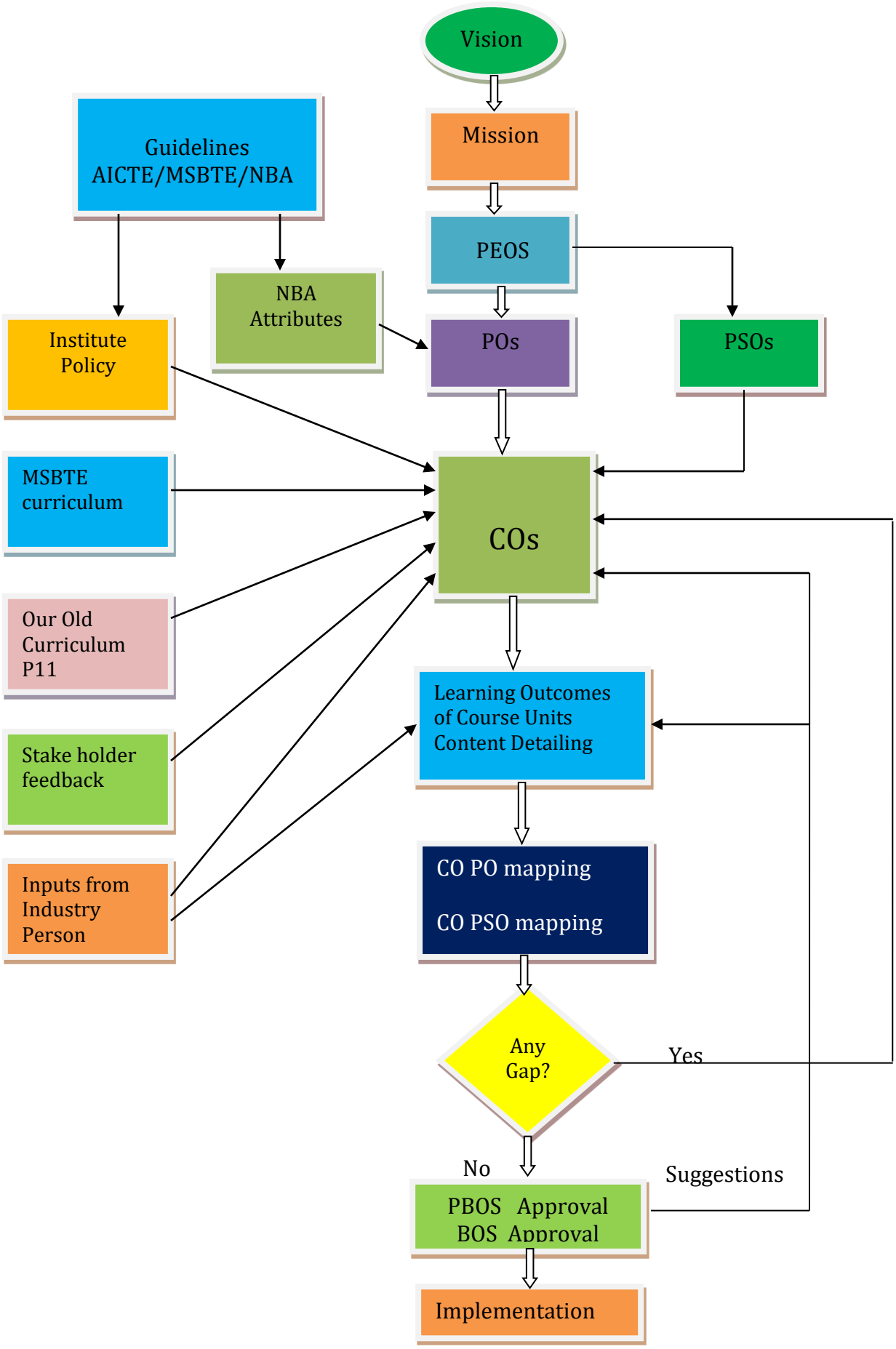

Fig. 2 Curriculum Design Process

Figure 1 shows outcome based education philosophy. Vision and mission statements will be 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 life long 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 analyze well 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 statements are 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 curriculum should be offered to students, we have offered Outcome based curriculum in 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 implant 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 implant 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.

2019 curriculum 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 incorporated six month implant training in their curriculum, wherein students will go for implant training in the industries during last semester. 20 credits (40 teaching hours per week) are allotted for implant 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 implant 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 implant training. A student will be eligible for registration of implant 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 implant training will be considered along with weightage from first semester to fourth semester courses as shown in following table.

All courses of fifth semester	700 to 800 Marks
Implant Training	200 Marks
Consolidated marks of first to fourth semester*	400 marks
Total marks	1300 to 1400 Marks

*Consolidated Marks of first to fourth semester – the total marks of first, second, third and fourth semesters are converted to 100 marks each. These marks are then added (1st Sem +2nd Sem +3rd Sem + 4th sem) as 100+100+100+100 = 400 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.

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

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.

6. 180 Credit Scheme- Level Wise Distribution

Programme: Information Technology

180 Credit Scheme 2019

Level wise Distribution of Courses

Level code	Title of Level	Course			Credits			Marks
		Compulsory	Optional	Total	L	P	Total	
1	Science and Humanities	5	0	5	13	6	19	550
2	Core Technology	12	0	12	27	30	57	1250
3	Applied Technology	16	0	16	24	63	87	1500
4	Diversified Courses	1	2	3	9	6	15	450
5	Management courses	1	0	1	0	2	2	50
	Total	35	2	37	73	107	180	3800

Level 1 : Science & Humanities

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		TH	TS1	TS2	PR	OR	TW	TOTAL
SC19103	Applied Physics	3	2		5	5	60	20	20	25*		25	150
SC19109	Basic Mathematics	4			4	4	60	20	20				100
HU19101	Communication Skill	2	2		4	4	60	20	20	25*		25	150
SC19110	Engineering Mathematics	4			4	4	60	20	20				100
HU19102	Environmental Studies		2		2	2					25	25	50
	Total	13	6		19	19	240	80	80	50	25	75	550

Level 2 : Core Technology

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		Th	TS1	TS2	PR	OR	TW	TOTAL
EC19210	Basics of Electrical and Electronic Engineering	2	2		4	4				50		25	75
IT19201	Web Technology	2	4		6	6				50*		50	100
IT19202	Logic Development using Programming in C	3	4		7	7	60	20	20	50*		25	175
IT19203	Latex (MOOC)		4#		4#	4#							
IT19204	Digital Techniques	3	2		5	5	60	20	20	25		25	150
CO19203	Computer hardware and maintenance		4		4	4				50*		50	100
IT19205	Object Oriented Programming using C++ (MOOC)	2	4#		6	6							
CO19204	Data structures	3	2		5	5	60	20	20	25*		25	150
IT19206	Data Communication	3			3	3	60	20	20				100
IT19207	Microprocessor	3	2		5	5	60	20	20	25		25	150
CO19206	Operating System	3	2		5	5	60	20	20		25*	25	150
CO19207	Software Engineering	3			3	3	60	20	20				100
	Total	27	30		57	57	420	140	140	275	25	250	1250

Level 3 : Applied Technology

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		TH	TS1	TS2	PR	OR	TW	TOTAL
IT19301	Blender (MOOC)		2#		2#	2#							
CO19306	Database Management System	3	4		7	7	60	20	20	50*		25	175
CO19303	Programming in Java	3	4		7	7	60	20	20	50*		25	175
IT19302	Multimedia Techniques	1	2		3	3				25*		25	50
IT19303	PHP & MYSQL (MOOC)		3#		3#	3#							
IT19304	Microcontroller & Embedded systems	3	2		5	5	60	20	20	25*		25	150
CO19305	Computer Networks	3	2		5	5	60	20	20		50*		150
IT19305	User Interface Design	1	2		3	3				25*		25	50
IT19306	Linux OS (MOOC)		3#		3#	3#							
IT19307	Artificial Intelligence	3	2		5	5					50*	50	100
IT19308	Network & Information Security	3	2		5	5	60	20	20		25*	25	150
IT19309	Project		4		4	4					50*	50	100
CO19308	Advance Programming in Java	2	4		6	6				50*		50	100
IT19310	R Programming (MOOC)		3#		3#	3#							
CO19309	Mobile Application Development	2	4		6	6				50*		50	100
IT19311	Implant Training	0	40	0	40	20	0	0	0	100*		100	200
	Total	24	83		107	87	300	100	100	375	175	450	1500

Level 4- Diversified Courses

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		TH	TS1	TS2	PR	OR	TW	TOTAL
IT19401 (Optional 1)	Python Programming	3	2		5	5	60	20	20	25*		25	150
CO19311 (optional 1)	Next Generation Databases												
IT19402 (Optional2)	Geographical Information System	3	2		5	5	60	20	20	25*		25	150
IT19403 (Optional2)	Introduction to Big data & Hadoop												
IT19404 (Optional 2)	Software Testing and Quality Assurance												
CO19405	Cloud Computing	3	2		5	5	60	20	20	25*		25	150
	Total	9	6		15	15	180	60	60	75		75	450

Level5- Management courses

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		Th	TS1	TS2	PR	OR	TW	TOTAL
IT19501	Entrepreneurship and Start-ups		2		2	2					25*	25	50
	Total		2		2	2					25*	25	50

MOOC Courses

Course code	Course Title	Teaching Hours/Contact Hours				Credits	Examination scheme						
		L	P	TU	TOTAL		Th	TS1	TS2	PR	OR	TW	TOTAL
IT19203	Latex (MOOC)		4#		4#	4#							
IT19205	Object Oriented Programming using C++ (MOOC)	2	4#		4#	4#							
IT19301	Blender (MOOC)		2#		2#	2#							
IT19303	PHP & MYSQL (MOOC)		3#		3#	3#							
IT19306	Linux OS (MOOC)		3#		3#	3#							
IT19310	R Programming (MOOC)		3#		3#	3#							
	Total		19#		19#	19#							

7. Semester Wise Credit and Marks Distribution

Sr. No.	Semester	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
							Theory			PR	OR	TW	Total
		L	P	TU	Total		TH	TS1	TS2				
1	**First**	14	16+5(SCA)		35	30	180	60	60	175	--	125	**600**
2	**Second**	14	16+5(SCA)		35	30	240	80	80	125		125	**650**
3	**Third**	13	17+5(SCA)		35	30	240	80	80	150	25	125	**700**
4	**Fourth**	18	17		35	35	300	100	100	125	75	150	**850**
5	**Fifth**	14	21		35	35	180	60	60	100	150	250	**800**
6	**Sixth**		40		40	20					100	100	**200**
Total		**73**	**142**		**215**	**180**	**1140**	**380**	**380**	**675**	**350**	**875**	**3800**
Credits		**73**	**107**				**1900**			**1900**			**3800**
Percentage		**40%**	**60%**				**50%**			**50%**			

8. Teaching and Examination Scheme of First Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme:Diploma in Information Technology (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				
SC19103	Applied Physics	3	2	--	5	5	60	20	20	25*	--	25	150
SC19109	Basic Mathematics	4	--	--	4	4	60	20	20	--	--		100
EC19210	Basics of Electrical and Electronic Engineering	2	2	--	4	4	--	--	--	50	--	25	75
IT19201	Web Technology	2	4	--	6	6	--	--	--	50*	--	50	100
IT19202	Logic Development using C Programming	3	4	--	7	7	60	20	20	50*	--	25	175
IT19203	Latex (Spoken Tutorial)	--	4#	--	4#	4#	--	--	--	--	--	--	--
	Total	**14**	**16**	**--**	**30**	**30**	**180**	**60**	**60**	**175**	**--**	**125**	**600**
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 assessment, #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- 2hours, Creative Activity-2 hours

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

Coordinator,
Curriculum Development,
Department of Information Technology

In-Charge
Curriculum Development Cell

Head of Department
Department of Information Technology

Principal

9. Teaching and Examination Scheme of Second Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
HU19101	Communication Skills	2	2		4	4	60	20	20	25*		25	150
SC19110	Engineering Mathematics	4			4	4	60	20	20				100
IT19204	Digital Techniques	3	2		5	5	60	20	20	25		25	150
CO19203	Computer Hardware and maintenance		4		4	4				50*		50	100
IT19205	Object Oriented Programming using C++ (MOOC)	2	4#		6	6							
CO19204	Data structures	3	2		5	5	60	20	20	25*		25	150
IT19301	Blender (MOOC)		2#		2#	2#							
	Total	**14**	**16**		**30**	**30**	**240**	**80**	**80**	**125**		**125**	**650**
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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

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Department of Information Technology

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10. Teaching and Examination Scheme of Third Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme (P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
CO19306	Database Management System	3	4		7	7	60	20	20	50*		25	175
IT19206	Data Communication	3	---		3	3	60	20	20				100
CO19303	Programming in Java	3	4		7	7	60	20	20	50*		25	175
IT19207	Microprocessor	3	2		5	5	60	20	20	25		25	150
IT19302	Multimedia Technology	1	2		3	3				25		25	50
HU19102	Environmental Studies		2		2	2					25	25	50
IT19303	PHP & MYSQL (MOOC)		3#		3#	3#							
	Total	**13**	**17**		**30**	**30**	**240**	**80**	**80**	**150**	**25**	**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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

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11. Teaching and Examination Scheme of Fourth Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
CO19206	Operating System	3	2		5	5	60	20	20		25*	25	150
CO19308	Advance Programming in Java	2	4		6	6				50*		50	100
IT19304	Microcontroller & Embedded systems	3	2		5	5	60	20	20	25*		25	150
IT19401 Optional1	Python Programming	3	2		5	5	60	20	20	25*		25	150
CO19311 Optional 1	Next Generation Databases												
CO19305	Computer Networks	3	2		5	5	60	20	20		50*		150
CO19207	Software Engineering	3	---		3	3	60	20	20				100
IT19305	User Interface Design	1	2		3	3				25*		25	50
IT19306	Linux OS (MOOC)		3#		3#	3#							
	Total	**18**	**17**		**35**	**35**	**300**	**100**	**100**	**125**	**75**	**150**	**850**

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 assessment, #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- 2hours, Creative Activity-2 hours

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

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12. Teaching and Examination Scheme of Fifth Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
CO19405	Cloud Computing	3	2		5	5	60	20	20	25*		25	150
IT19307	Artificial Intelligence	3	2		5	5					50*	50	100
IT19501	Entrepreneurship and Start-ups		2		2	2					25*	25	50
IT19308	Network and Information Security	3	2		5	5	60	20	20		25*	25	150
CO19309	Mobile Application Development	2	4		6	6				50*		50	100
IT19402 Optional 2	Geographical Information System	3	2		5	5	60	20	20	25*		25	150
IT19403 Optional 2	Introduction to Big data & Hadoop												
IT19404 Optional 2	Software Testing and Quality Assurance												
IT19309	Project		4		4	4					50*	50	100
IT19310	R Programming (MOOC)		3#		3#	3#							
	Total	**14**	**21**		**35**	**35**	**180**	**60**	**60**	**100**	**150**	**250**	**800**

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 assessment, **#**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- 2hours, Creative Activity-2 hours

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

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13. Teaching and Examination Scheme of Sixth Semester

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme (P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
IT19311	Implant 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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

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14. Award of Diploma (Courses for award of diploma)

Diploma award courses will have weightage from third semester courses to fourth semester courses. The total marks of 3rd, 4th semester courses marks will be converted to 100 marks each. These 2 X 100 = 200 Marks will appear in the final mark sheet as consolidated marks of 3rd to 4th semester. Diploma award i.e. final mark sheet will be as follows:

Semester 3	Consolidated Marks													**100**
Semester 4	Consolidated Marks													**100**
Semester 5 (All cources)	Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
								Theory			PR	OR	TW	Total
			L	P	TU	Total		TH	TS1	TS2				
	CO19405	Cloud Computing	3	2		5	5	60	20	20	25*		25	150
	IT19307	Artificial Intelligence	3	2		5	5					50*	50	100
	IT19501	Entrepreneurship and Start-ups		2		2	2					25*	25	50
	IT19308	Network and Information Security	3	2		5	5	60	20	20		25*	25	150
	CO19309	Mobile Application Development	2	4		6	6				50*		50	100
	IT19402 Optional 2	Geographical Information System	3	2		5	5	60	20	20	25*		25	150
	IT19403 Optional 2	Introduction to Big data & Hadoop												
	IT19404 Optional 2	Software Testing and Quality Assurance												
	IT19309	Project		4		4	4					50*	50	100
Semester 6	IT19311	Implant Training	0	40		40	20	0	0	0	0	100*	100	200
Total			**14**	**58**	**0**	**72**	**52**	**180**	**60**	**60**	**100**	**250**	**350**	**1200**

Direct second Year admitted students Backlog Courses

Students admitted in direct second year are required to complete some pre requisite for award of Diploma in Information Technology

1] Student who has passed HSC Science with mathematics:-

All such students are required to complete the course “Programming in C”, through spoken tutorial. Students should register for this course on spoken tutorial website. He/she should complete the course online, and should appear for online examination of the same. Student should submit the passing certificate of the same, without which diploma will not be awarded.

Exemption will be given to these students in rest of all courses of First and Second semester of P19 scheme.

2] Student who has passed HSC Science without mathematics, ITI students and MCVC students:-

These students are required to register for the course “Basic Mathematics (SC19109)”. He/she should attend the regular classes of this course along with First year students. He/she should appear for regular examination of the course and should pass in it, without which diploma will not be awarded.

These students are required to complete the course “Programming in C”, through spoken tutorial. Students should register for this course on spoken tutorial website. He/she should complete the course online, and should appear for online examination of the same. Student should submit the passing certificate of the same, without which diploma will not be awarded.

Exemption will be given to these students in rest of all courses of First and Second semester of P19 scheme.

Students admitted under Change of Programme to Information Technology from other Programmes in Second Year

In 2019 curriculum scheme, students are going for implant training in the sixth semester. The whole 3 years curriculum is compressed between 2 and half year. So domain specific courses of IT are offered in first and second semester. If a student from other programme is admitted in second year in IT, student has to complete these domain specific courses of 1st and 2nd semester in his second year that is in 3rd and 4th semester. These courses will be as per following table.

Courses to be completed by the student admitted in IT from other Programme.

Sr. No.	Programme	Additional Courses Need to Complete for award of diploma in Information Technology
1	Computer Engineering	Nil
2	Electronics Engineering	1. Programming in C through spoken tutorial as a prerequisite for 3rd Semester. Student should register for this course on spoken tutorial website, complete the course online, appear for online exam conducted by spoken tutorial and should produce passing certificate, without which diploma will not be awarded. 2. Data Structures CO19204 should be registered in fourth semester along with regular courses of fourth semester. Student should attend the regular classes with first year students, attend the exam and should pass it. Student should earn credits CO19204, without which diploma will not be awarded. 3. Student will be exempted from the rest of the courses of first and second semester of P19 scheme of IT programme.
3	Electrical Engineering	
4	Instrumentation Engineering	
5	Civil Engineering	
6	Mechanical Engineering	
7	Leather Technology	
8	Leather Goods and Footwear Technology	

Government PolytechnicMumbai

(Academically Autonomous Institute of Govt. of Maharashtra)

Department of Information Technology

Equivalence of P16 to P19 Scheme

Government Polytechnic Mumbai
Information Technology Department
(Equivalence of P16 Scheme to P19 Scheme)

First Year First Semester

P 16 Scheme		P 19 Scheme		
Course Code	**Course Title**	**Course Code**	**Course Title**	**Semester**
HU16101	Basics of Communication	HU19101	Communication Skill	Second
HU16103	Generic Skills	No equivalence. Should be completed across the table.		
ME16201	Engineering Drawing I	ME19201 Engineering Drawing I of Mechanical Engineering Dept.		
EE16201	Fundamentals of Electrical Engineering	EC19210 Basics of Electrical and Electronics Engineering		
SC16107	Mathematics I	SC19109	Basic Mathematics	First
SC16106	Chemistry of Engineering Materials	SC19107	Engineering Chemistry	First (CE)
IT16201	Basics of Information Technology	MSCIT		

First Year Second Semester

Course Code (P16)	Course Title (P16)	Course Code (P19)	Course Title (P19)	Semester
SC16104	Engineering Physics	SC19103	Applied Physics	First
HU16102	Communication Skills	No equivalence. Should be completed across the table.		
SC16108	Mathematics II	SC19110	Engineering Mathematics	First
IT16202	Programming in C	IT19202	Logic Development using C Programming	First
EC16204	Basics of Electronics Engg.	EC19210 Basics of Electrical and Electronics Engineering		
IT16203	Web Technology	IT19201	Web Technology	First
HU16104	Environmental Studies	HU19102	Environmental Studies	Fourth

Second Year Third Semester

P 16 Scheme		P 19 Scheme		
Course Code	**Course Title**	**Course Code**	**Course Title**	**Semester**
IT16204	Digital Techniques	IT19204	Digital Techniques	Second
IT16301	Professional Practice	2 week industrial training		
IT16206	Data Communication	IT19206	Data Communication	Third
IT16302	Computer Peripheral and Maintenance	CO19203	Computer hardware and maintenance	Second
IT16206	Object Oriented Programming using C++	CO19202	Programming in C++	Second
IT16303	Database Management System	CO19306	Database Management System	Third
IT16304	UID Programming	IT19305	UID Programming	Fourth

Second Year Fourth Semester

P 16 Scheme		P 19 Scheme		
Course Code	**Course Title**	**Course Code**	**Course Title**	**Semester**
IT16305	Data Structure and Applications	CO19204	Data Structure	Second
CO16205	Microprocessor	IT19207	Microprocessor	Third
IT16306	Computer networking	CO19305	Computer networks	Third
CO16307	Java Programming	CO19303	Programming in Java	Third
IT16307	Multimedia Techniques	IT19302	Multimedia Technology	Third
IT16308	Operating System	CO19206	Operating System	Fourth
MG16502	Entrepreneurship Development	IT19501	Entrepreneurship and Start-ups	Fifth

P 16 Scheme		P 19 Scheme		
Course Code	**Course Title**	**Course Code**	**Course Title**	**Semester**
IT16309	Information Security	IT19308	Network and Information Security	Fifth
CO16501	Software Engineering	CO19207	Software Engineering	Fourth
IT16314	Advanced Java Programming	CO19308	Advanced Programming in Java	Fifth
IT16310	Linux Operating System	No equivalence		
IT16401 (Optional 1)	Python Programming	IT19401	Python Programming	Fourth
CO16403 (Optional 1)	Advance Database Technology	CO19311	Next Generation Databases	Fourth
IT16402 (Optional 1)	Microcontroller and Embedded Systems	IT19304	Microcontroller and Embedded Systems	Fourth
IT16312	Project and Seminar Stage-1	No equivalence		
IT16311	Advanced Web Technology	CO19401	Advanced Web Development	Fourth (CO)
IT16313	Industrial Training (During Summer Break after 4th Semester)	Industrial training of 4 weeks		

Third Year Sixth Semester

P 16 Scheme		P 19 Scheme		
Course Code	**Course Title**	**Course Code**	**Course Title**	**Semester**
IT16501	Management Information System	No equivalence		
IT16315	Cloud Computing	CO19405	Cloud Computing	Fifth
IT16316	Software Testing and Quality Assurance	CO19313	Software testing	Fifth (CO)
IT16403 (O2)	Introduction to Big Data and Hadoop	IT19403	Introduction to Big Data and Hadoop	Fifth
IT16404 (O2)	Internet of Things	IT19311	Internet of things (MOOC)	Fifth
IT16405 (O2)	Geographical Information System (GIS)	IT19403	Geographical Information System (GIS)	Fifth
IT16317	Project and Seminar Stage II	No equivalence		
IT16318	Mobile Application Development	CO19309	Mobile Application Development	Fourth
IT16319	Industrial Training (During Summer Break after 5th Semester)	Industrial training of 2 weeks		

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.

18. Course Contents Semester Wise

Government Polytechnic Mumbai

(Academically Autonomous Institute of Govt. of Maharashtra)

Information Technology Department

P19 Curriculum

First Semester

Implemented from July 2019

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
SC19103	Applied Physics	3	2	--	5	5	60	20	20	25*	--	25	150
SC19109	Basic Mathematics	4	--	--	4	4	60	20	20	--	--		100
EC19210	Basics of Electrical and Electronic Engineering	2	2	--	4	4	--	--	--	50	--	25	75
IT19201	Web Technology	2	4	--	6	6	--	--	--	50*	--	50	100
IT19202	Logic Development using C Programming	3	4	--	7	7	60	20	20	50*	--	25	175
IT19203	Latex (Spoken Tutorial)	--	4#	--	4#	4#	--	--	--	--	--	--	--
	Total	**14**	**16**	**--**	**30**	**30**	**180**	**60**	**60**	**175**	**--**	**125**	**600**
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 assessment, #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- 2hours, Creative Activity-2 hours

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

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Programme : **Diploma in Information Technology / Computer Engineering (IT/ CO) (Sandwich pattern)**										
Course Code: **SC19103**				Course Title: **Applied Physics**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs30 minutes)	TS1 (1Hr.)	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:

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 physical measurement.
CO2	Apply laws of motion in various Engineering applications
CO3	Apply the concept of electric field and electromagnetism in Engineering technology
CO4	Identify properties and application of light in Engineering field

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 minimization of errors, 1.7 Numerical problems. **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, acceleration due to gravity, equation of motion under gravity, numerical problems. **2.2 Periodic motions**: a) Oscillatory motion, b) Vibratory motion, c) S.H.M., d) Circular motion. (Only definition and examples) ,terms related to S.H.M: Definition: Time period, frequency, amplitude, wavelength, and phase. **2.3 Angular motion**: a) Definition: Angular motion,. 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 :10 hrs. Marks: 10 (R- 2 , U-4 , A-4)**
3	**Electrostatics** 3.1 Definition of charge 3.2 Coulomb's 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 (only equation) **Course Outcome: CO3 Teaching Hours :6 hrs. Marks: 8 (R- 2 , U-2 , A- 4)**
4	**Electricity** 4.1 Ohm's Law, Statement and mathematical expression 4.2 Resistance & unit of its, Specific resistance, unit of specific resistance. 4.3 Resistance in series and parallel combination, shunt Resistance 4.4 Wheatstone network , balancing condition for it 4.5 Numerical problems **Course Outcome: CO3 Teaching Hours :8 hrs. Marks: 12 (R- 2 , U- 6 , A- 4)**

5	**Electromagnetism** 5.1 Magnetic effect of current , magnetic induction 5.2 Properties of magnetic lines of force, 5.3 Laplace's law, Fleming left hand rule 5.4 Magnetic induction at Centre of circular coil carrying current only equation 5.5 Force acting on conductor carrying current placed in magnetic field (no derivation) 5.6 Numerical problems. **Course Outcome: CO3 Teaching Hours: 6 hrs. Marks: 8 (R- 2 , U- 2 , A- 4)**
6	**Optics and Optical Fiber** **6.1 Optics** 6.1.1 Revision of reflection and refraction of light. 6.1.2 Laws of refraction, Snell's law. 6.1.3 Prism formula (derivation) 6.1.4 Numerical problems. **6.2 Optical Fibers :** 6.2.1 Principle of propagation of light through optical fiber. 6.2.2 Structure of Optical fiber. 6.2.3 Applications (electronics and medical) and comparison with electrical cable for communication. **Course Outcome: CO4 Teaching Hours : 9 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	**Units and Measurements**	2	2	4	8
2	**Motion**	2	4	4	10
3	**Electrostatic**	2	2	4	8
4	**Electricity**	2	6	4	12
5	**Electromagnetism**	2	2	4	8
6	**Optics and Optical Fiber**	4	6	4	14
	Total	**14**	**22**	**24**	**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	4	CO 3	To verify Ohm's Law.	2
5	4	CO 3	To find resultant resistance when resistances are connected in series .	2
6	6	CO 4	To find refractive index of a given prism by using pin method.	2
7	2	CO 1	To measure the dimensions of given objects and to determine their Volume using micrometer screw gauge.	2
8	1	CO 2	To determine stiffness constant by using helical spring.	2
9	3	CO 3	To verify Coulomb's law of electrostatics.	2
10	4	CO 3	To find resultant resistance when resistances are connected in parallel	2
11	4	CO 3	To find unknown resistance by using Wheatstone's Bridge.	2
12	4	CO 3	To verify principle of potentiometer.	2
13	5	CO 3	To study properties of magnetic line of force.	2
14	6	CO 4	To demonstrate spectrometer.	2
15	ALL	CO 1	Showing Video on different applications related to units,	2
			Total	**30**

Note: Experiments No. 1to10 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
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8. MYCBSEGUIDE
9. **https://ndl.iitkgp.ac.in/**

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr.Akshay Mahapadi	Sr. Software Specialist	Mastek , Mahape Ghansoli
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4	Dr. D.S. Nikam	Lecturer in Physics	Govt. Polytechnic Mumbai

Coordinator, Head of Departments

Curriculum Development, Department of Sci. & Humanities

Department of Sci. & Humanities

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:

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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
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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 Information Technology and Computer Engineering (Sandwich Pattern)										
Course Code: **EC19210**				Course Title: **Basics of Electrical and Electronics Engineering**						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
2	**2**	**--**	**4**	**--**	**--**	**--**	**50**	--	**25**	**75**

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 foundation for working of computer and its peripherals are based on electronics. Circuits used in computer and its peripherals utilize electrical energy for their operations. The course has been designed to give fundamental knowledge of electrical and electronics circuits. It will develop skills in students to understand simple electrical and electronic components and circuits, so that they will be able to handle computer hardware and its peripherals.

Course Outcomes: Student should be able to

CO1	Explain fundamentals of alternating quantities and its behavior with resistive, inductive and capacitive circuits.
CO2	Apply KCL, KVL, Voltage division rule, and current division rule to a series or parallel circuit.
CO3	Explain the working of various semiconductor devices.
CO4	Design and experiment with various application circuits using diodes and transistors.
CO5	Use optoelectronic devices in various electronic circuits

Course Content Details:

Unit No	Topics / Sub-topics
1	**AC fundamentals** 1.1 Alternating Current, Sinusoidal waveforms Mathematical Expression of alternating quantity. 1.2 Definition of Waveform instantaneous value, Cycle, Time period, Frequency, Amplitude, Peak value, Average value and RMS value, Form factor and Peak factor for sinusoidal wave, Phase, Phase difference, Phasor representation of sinusoidal quantities. 1.3 Electrical circuit elements: Resistors, Inductors, Capacitors Their properties, units, symbols

	1.4 Resistors in series and parallel 1.5 Capacitors in series and parallel **Course Outcome: CO1 Teaching Hours : 04 Marks: R- NA, U-NA, A-NA**
2	**DC Circuits** 2.1 Direct current definition and waveform, Difference between AC and DC 2.2 DC series circuit: Concept, Equation for equivalent resistance connected in series, Voltage division rule, Application of series circuit. 2.3 DC Parallel circuit**:** Concept, Equation for equivalent resistance connected in parallel, Current division rule, Application of Parallel circuit 2.4 Series parallel circuit, Application of series parallel circuit. 2.5 Definition of Circuit, Parameter, Linear 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. **Course Outcome: CO2 Teaching Hours : 06 Marks: R- NA,U-NA, A-NA**
3	**AC circuits** 3.1 Performance of AC when it passes through Pure R, Pure L and Pure C 3.2 Concept of inductive reactance and capacitive reactance and impedance. 3.3 Circuit diagram, phasor diagram and waveform for RL, series, RC series and RLC series circuit. Impedance and Impedance Triangle. 3.4 Active power, Reactive power and apparent power, power factor. (only Definitions) 3.5 Transformer: Faraday's law of electromagnetic induction, Fleming's right hand rule, Lenz's law (Only statements), Working principal and main parts of transformer, types of transformer based on transformation ratio (k) **Course Outcome: CO1 Teaching Hours : 05 Marks: R- NA, U-NA, A- NA**
4	**Semiconductor Devices** 4.1 Semiconductors: Intrinsic, Extrinsic semiconductor, P type, N type semiconductor 4.2 Semiconductor Diode: PN junction diode, Zener diode, (Symbol, working, VI characteristics, applications) 4.3 Transistors: 4.3.1 BJT: NPN, PNP transistors (symbol, working, necessity of biasing, biasing methods, Active, cut off, saturation region. 4.3.2 FET: N channel, P channel (symbol, working) 4.4 Difference between BJT and FET 4.5. MOSFET (symbol, working, applications) **Course Outcome: CO3 Teaching Hours : 06 Marks: R- NA, U-NA, A- NA**
5	**Optoelectronic Devices** 5.1 LED, LASER diodes, 7 segment display 5.2 Photodiode 5.3 Photovoltaic or solar cells 5.4 Phototransistor

	5.5 Optocoupler (Only Symbols, working and Applications of all these devices) **Course Outcome: CO5 Teaching Hours : 03 Marks: R- NA, U-NA, A- NA**
6	**Applications of Semiconductor Devices** 6.1. Rectifiers and filters: Half Wave Rectifier, Full Wave Rectifier and Bridge rectifier with RC, LC, II filter (Circuits, waveforms, applications, comparison, No mathematical analysis) 6.2. Diode as clipper : Series diode clipper, Parallel diode clipper (Circuits, waveform, working), Positive clipper, Negative clipper) 6.3. Diode as clamper: Positive clamper, Negative clamper 6.4. Zener diode as a voltage regulator 6.5. Transistor as an amplifier 6.6. Transistors as a switch **Course Outcome: CO4 Teaching Hours : 06 Marks: R- NA, U-NA, A- NA**

List of experiments: First six experiments are compulsory. Any 4 experiments out of 7 to 13. Mini project is compulsory.

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	Measure voltages and currents in series and parallel resistive circuit and verify voltage division rule and current division rule.	02
2	2	CO2	Verify KCL and KVL	02
3	4 & 6	CO3 CO4	To construct and test half wave rectifier. Observe and measure input and output waveforms (Amplitude, frequency)	02
4	4 & 6	CO3 CO4	To construct and test Zener voltage regulator. Find out load and line regulation.	02
5	5	CO5	To construct electronic circuit using optocoupler and test it.	02
6	3	CO1	Measure the phase relation between voltage and current in pure resistive, inductive and capacitive circuit.	02
7	1	CO1	Measure amplitude, frequency of a sinusoidal waveform on oscilloscope	02
8	3	CO1	Determine impedance, phase angle, active, reactive and apparent power in RL series circuit.	02
9	6	CO3 CO4	To construct and test full wave rectifier. Observe and measure input and output waveforms (Amplitude, frequency)	02
10	6	CO3 CO4	To construct and test Bridge rectifier. Observe and measure input and output waveforms (Amplitude, frequency)	02
11	6	CO3 CO4	To construct and test transistor as a switch.	02
12	6	CO4	To construct and see the waveforms of any type of clipper	02
13	6	CO4	To construct and see the waveforms of any type of clamper	02
14	4,5,6	CO1 to CO5	Mini Project (Electronic hobby kit)	04
			Total	**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Principles of Electrical Engineering and Electronics	V. K. Mehta, Rohit Mehta, S. Chand, First, 1996	81-219-2729-3
2	Electrical Technology Volume I	B. L. Theraja, A. K. Theraja, S. Chand, First, 2006	81-219-2440-5
3	Electrical Technology Volume IV	B. L. Theraja, A. K. Theraja, S. Chand, First, 2006	978-81-219-2667-6
4	Electrical and Electronic Technology	Hughes, Pearson, Ninth, 2005	978-81-317-1468-3

E-References:

1. www.electricaltechnology.org
2. www.electronics-tutorials.ws
3. www.allaboutcircuits.com
4. www.alldatasheet.com
5. www.electronics.wisc-online.com
6. www.vlab.co.in

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

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

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

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Sandeep Dongare	General Manager	HCL Technologies
2	Mrs. B. S. Motling	Head of Electrical Department	K. J. Somaiya Polytechnic Mumbai
3	Mrs. S. N. Nagargoje	Lecturer in Electronics	Govt. Polytechnic Thane
4	Dr. R. A. Patil	Sel. Gr. Lecturer in Electronics,	Govt. Polytechnic Mumbai
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Coordinator
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Department of Electronics Engineering

Head of Department
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I/C, Curriculum Development Cell

Principal

Programme :**Diploma in Information Technology (Sandwich Pattern)**										
Course Code:**IT19201**				Course Title: **Web Technology**						
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
2	**4**	**---**	**6**	**--**	**--**	**--**	**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: Diploma holders of Information Technology often work to develop professional looking static and dynamic websites using different Web Technologies. Some common Web technologies which are used to develop websites are HTML, JavaScript, CSS, XML, XHTML, AJAX, ASP.NET , PHP.

This is a Hands-on course in designing and developing Static World Wide Web pages using HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) which will develop abilities in students to create and deploy Static Web pages.

Course Outcomes: Student should be able to

CO1	Visualize the basic concept of HTML.
CO2	Recognize the elements of HTML.
CO3	Develop CSS code for HTML file
CO4	Create a fully functioning static website.
CO5	Develop the concept of web publishing.

Course Content Details:

Unit No	Topics / Sub-topics
1	**INTRODUCTION TO WEB TECHNOLOGY-** **1.1Careers in Web Technologies and Job Profile** **1.2 Web Site Design Principles** – How the Website Works?, Five Golden rules of web designing, Analyze your Audience, Build a Web Site Development Team, Filenames and URLs, Directory Structure, Diagram the Site. **1.3 Planning Site Navigation** – Creating Usable Navigation, Using Text Based Navigation, Using Graphics- Based Navigation. **1.4 Fundamental Of World wide web :**World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for searching the content

	Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e- Reservation, e-Groups, Social Networking **Course Outcome- CO1 Teaching Hours – 04 Marks –NA**
2	**HTML 4.01: INTRODUCTION TO ELEMENTS OF HTML** **2.1 Basic structure tags:** !DOCTYPE, HTML, HEAD, TITLE, BODY with attributes **2.2 Block level tags and horizontal rules:** Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, Address, HR tag. **2.3 Text level tags and special characters:** Bold, Italic, Teletype, Underline ,Strikethrough, Superscript, Subscript, DIV tag **2.4 Working with lists:** Ordered Lists, Unordered Lists, Definition Lists, Nested Lists. **2.5 URL and Anchor tag: URL**: Types of URLs, Absolute URLs, Relative URLs . **Anchor Tag:**Linking various documents for internal and external links. Marquee Tag. **2.6 IMAGES, COLORS AND BACKGROUNDS:** IMG tag and different Image formats, colors and backgrounds. **Course Outcome- CO1 Teaching Hours – 06 Marks –NA**
3	**TABLE, FRAME AND FORMS** **3.1 Working with table:** TABLE tag with attributes. TABLE, TR, TH, TD tags, border, cell spacing, cell padding, width, align, bgcolor attributes. **3.2 Working with frame:** Types of Frames with their attributes Creating frames: FRAMESET tag – rows, cols attributes, FRAME tag –name, frame border, margin height, margin width, src, resize, scrolling attributes. Use of NOFRAMES tag, Frame targeting. **3.3 Working with forms and controls:** Creating basic form: FORM tag, action and method attributes. **Form fields**: Single line text field, password field, multiple line text area, radio buttons, and check boxes. **Pull down menus**: SELECT and OPTION tags. **Buttons**: submit, reset and generalized buttons **3.**4 Introduction To **IFRAME** **Course Outcome- CO2 Teaching Hours – 06 Marks –NA**
4	**HTML5** **4.1 Introduction to HTML5** **4.2 Whats new in HTML5**: New Structure Tags (SECTION, NAV, ARTICLE,ASIDE, HEADER, FOOTER), New Form Tags (search, tel, url, email, number and range), HTML5 DocType **Course Outcome- CO2 Teaching Hours – 04 Marks –NA**
5	**INTRODUCTION TO XHTML 1.1** **5.1** What is XHTML (E**x**tensible **H**yper **T**ext **M**arkup **L**anguage) **5.2** Difference between HTML & XHTML **5.3** Introduction to Doc Types (Strict, Transitional and Mobile) **Course Outcome- CO3 Teaching Hours – 02 Marks –NA**
6	**CASCADING STYLE SHEETS 2.0** **6.1** Introduction to CSS **6.2** Types of Style Sheets (Inline, Internal and External) **6.3** Creating Style Sheet **6.4** CSS Properties **6.5** CSS Styling(Background, Text Format, Controlling Fonts) **6.6** Working with block elements and objects **6.7** Working with Lists and Tables **6.8** CSS Id and Class **6.9** Box Model(Introduction, Border properties, Padding Properties, Margin properties)

	6.10 CSS Color **6.11** Creating page Layout and Site Designs. **Course Outcome- CO3 Teaching Hours – 04 Marks –NA**
7	**CASCADING STYLE SHEETS (CSS 3.0)** 7.1 **Introduction to CSS 3** **7.2 NEW CSS3.0 PROPERTIES:** CSS Rounded Corners, Border Images, Border Shadows, CSS Gradients, CSS Background properties, Text-Shadow Property, Text-Stroke Property **Course Outcome- CO3 Teaching Hours – 02 Marks –NA**
8	**PUBLISHING AND MAINTAINING YOUR WEB SITE** 8.1 Publishing Your Web Site 8.2 Testing Your Web Site 8.3 Refining and Updating Your Content 8.4 Attracting Notice to Your Web Site 8.5 Create Web Sites and Publishing on free web servers (zoomla,Yola) **Course Outcome- CO4,5 Teaching Hours – 02 Marks –NA**

List of experiments: First 7 Experiments are compulsory and any 3 experiments out of 8 to 14 . Mini project is compulsory

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	1. Study of internal and external devices 2.Formatting word documents and excel sheets ,table 3.Accessing internet and study of web pages	4
2	1	CO1	Build a Website Development Team, Analyze your Audience Identify the Contents, decide Filenames and URL, create Directory Structure for your website, Diagram your selected web Site. For Example: 1. Web site for Information Technology/ Computer Department. 2. Web site for any Vehicle Showroom 3. Web site for Travel and Tourism Agency 4. Web site for any Sport.(Ex. Cricket, Tennis etc.) 5. Any other suggested topic by subject teacher.	4
3	2	CO2	Write a HTML code for creating Web page using structure tags Create a web page for displaying a paragraph using Block level, HR tags, Text level tags and special characters.	4
4	2	CO2	1.Create a web page for implementing different types of Lists 2. Create a web page to link 2.1 A different web page of same site 2.2 A different location on same web page. 2.3 A specific location on different web page in the same site	4
5	3	CO3	Create a web page for applying Background, Text Format, and Controlling Fonts using CSS	4
6	3	CO3	Create static web page for students Registration form using FORM tag ,css	4
7	3	CO5	1.install a web server and publish a website on internet 2. Publish a website on internet by acquiring space on free hosting site	4
8	4	CO2	Create a web page for changing colors of links using BODY tag attributes	4

9	4	CO3	create a web page using IMG tag implementing various attributes, implementing image as a button and setting image as background.	4
10	2	CO2	1.Create a web page link to: 1.An external page of different web site 2. To an Email ID 2.Write a tags to change color of links	4
11	6	CO3	Create a web page for demonstration of CSS applying Internal/External/ Inline style	4
12	5	CO3	Create a web page using HTML5 tags (Structure Tags, Form Tags)	4
13	6	CO3	Working with List, HTML elements box, Positioning and Block properties in CSS 3.0	4
14	6,7	CO3	Creating one page Layout using CSS.	4
15	8	CO1 CO5	Mini project Creation and Publishing Finalizing Mini Project containing minimum Ten web pages from above practical and Publishing it.	4
			Total	**60**

References/ Books:

Sr. No.	**Title**	**Author, Publisher, Edition and Year Of publication**	**ISBN**
1	HTML and XHTML – Thecomplete reference	Thomas Powel Tata McGraw Hill, NewDelhi	9780070582811
2	Html5 Black Book	Kogent LearningSolutions Inc DreamTech	978-9351199076
3	Murach's HTML5 and CSS3	Zak Ruvalcaba andAnne Boehm Murach	9781943872268
4	Learning Web Design	Robbins, O'Reilly	9781449337551
5	HTML,XHTML and CSS	Anne BohemMurach's Publication	9788183335157

E-References:

1 https://www.w3schools.com/html
2 https://www.tutorialspoint.com/html/index.htm
3 https://www.programiz.com
4 https://www.udemy.com
5 https://www.w3.org › standards › webdesign
6 https://coder-coder.com/learn-web-development

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms. Farheen S. Shaikh	Sr. Software Developer	Capgemini India
2	Ms. Sadaf Shaikh	Lecturer in Information Technology	Government Polytechnic, Thane
3	Ms.D.B.Gosavi	Lecturer in Information Technology	Government Polytechnic, Mumbai

Coordinator, Head of Department

Curriculum Development, Department of Information Technology

Department of Information Technology

I/C, Curriculum Development Cell Principal

Programme : **Diploma in Information Technology and Computer Engineering (sandwich Pattern)**										
Course Code: **IT19202**				Course Title: **Logic Development using C Programming**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1 Hr)	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 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:

In today's information technology era, computer technology plays an important role. Computer applications are all pervasive in day to day life of human being. It became compulsory to all employable to have sound knowledge of how computer works and process data and information.

This subject covers from the basic concept of C to pointers in C. This course will act as "programming concept developer" for students. It will also act as "Backbone" for subjects like OOPS, VB, Windows Programming, JAVA, OOMD, etc.

Course Outcomes: Student should be able to

CO1	Illustrate the Flowchart and describe an algorithm for a given program.
CO2	Use Conditional and iterative statements in C programs.
CO3	Demonstrate the use of user defined functions to solve real time problems
CO4	Describe C Programs using pointers and to allocate memory using dynamic memory management functions
CO5	Develop programs using input and output operations
CO6	Use of constants, variables, data types and operators and arrays in programs.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Program Logic development** **1.1 Fundamentals of algorithms:** Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures. **1.2 Algorithmic problems**: Develop fundamental algorithms for (i) Exchange the values of two variables with and without temporary variable, (ii) Counting positive numbers from a set of integers, (iii) Summation of set of numbers, (iv) Reversing the digits of an integer, (v) Find smallest positive divisor of an integer other than 1, (vi) Find G.C.D. and L.C.M. of two as well as three positive integers, (vii) Generating

	prime numbers. **1.3 Flow chart:** Draw flow charts for all algorithms developed **Course Outcome- CO1 Teaching Hours – 05 Marks: 08 (R-02 U-02 A-04)**
2	**Basics of C programming** **2.1 Different approaches in programming:** Procedural approach, Object Oriented approach, Event Driven approach. **2.2 Structure of C:** Header and body, Use of comments, Compilation of a program. **2.3Data Concepts:** Variables, Constants, data types like: int, float char, double and void. Qualifiers: short and long size qualifiers, signed and unsigned qualifiers. Declaring variables, Scope of the variables according to block, Hierarchy of data types. **2.4 Operators in C**:Logical , Arithmetic, Bitwise, Relational, Assignment **2.5 Basic Input output:** C program structure, Input and output using printf() and scanf(), character I/O.(Programs based on I/O) **Course Outcome- CO2,CO5 Teaching Hours – 08 Marks:10(R-02 U-03 A-05)**
3	**Control Structures** **3.1Decision making:** If Statement, If else statement, Nesting of if-else **3.2 branching:** The switch statement **3.3 Looping**: While loop, Do-while loop, For loop 3.4 Ternary operator 3.5 Go to statement 3.6 Use of break and continue statements **Course Outcome- CO6 Teaching Hours – 08 Marks:08 (R-02 U-02 A-04)**
4	**Arrays and Strings** 4.1 One dimension, two dimension and multidimensional arrays 4.2 Array declaration 4.3 Array initialization 4.4 calculating the length of an array 4.5 Operation on array 4.6 String input/output 4.7 String operations 4.8 Array of strings **Course Outcome- CO2, CO5 Teaching Hours – 08 Marks:10 (R-02 U-04 A-04)**
5	**Functions** 5.1 Concept of library functions 5.2 String functions (comparison, concatenation, length) 5.3 User-defined functions 5.4 Local & global variables 5.5 Parameter passing 5.6 Storage classes **Course Outcome- CO3 Teaching Hours – 05 Marks:08 (R-02 U-02 A-04)**
6	**Structure and Union** 6.1 Basic Concept 6.2 Structure declaration, initialization 6.3 Structure within structure 6.4 Nested Structures 6.5 Array of Structure

	6.6 Union **Course Outcome- CO5, CO2 Teaching Hours:05 Marks:08 (R-02 U-02 A-04)**
7	**Pointers** 7.1Basic concept 7.2Pointer & arrays 7.3Pointer & functions 7.4 Pointer arithmetic **Course Outcome- CO4 Teaching Hours:06 Marks:08 (R-02 U-02 A-04)**

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Program Logic development	02	02	04	8
2	Basics of C programming	02	03	05	10
3	Control Structures	02	02	04	8
4	Arrays and Strings	02	04	04	10
5	Functions	02	02	04	8
6	Structure and Union	02	02	04	8
7	Pointers	02	02	04	8
	Total	**14**	**17**	**29**	**60**

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

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

List of experiments: First 7 Experiments are compulsory and any 3 experiments out of 8 to 14. Mini project is compulsory.

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	Write an **algorithm** and draw the **flow chart** for following: a)To find out number is odd or even. b)To find out factorial value of a number. c)To check a number is prime number or not.	4
2	1,2	CO5	Program based on Input/output statement. a)To find out number is odd or even. b)To find out factorial value of a number. c)To check a number is prime number or not.	4
3	3	CO2	Program using control structures: Branching a) To find the greatest number among three numbers using nested if b) Program that asks user an arithmetic operator ('+','-','*' or '/') and two operands and perform the corresponding calculation on the operands using switch case	4

4	3	CO2	Program using control structures: Looping(using loops) a) To find the sum of first n natural numbers where n is entered by user. b) To Find Number of Digits in a Number. c) To check whether a number is palindrome or not. d) To Generate Multiplication Table.	4
5	4	CO6	Program to accept values in 2-Dimensional 3 by 3 arrays and displays the sum of all the elements.	4
6	5	CO3	Program using function(call by value) a) to swap to numbers b) to find square of a given number	4
7	7	CO4	Program using pointer.	4
8	4	CO6 CO3	Program using array of strings.	4
9	1.2.3	CO2	Program using control structures: **Decision making** a) To find whether the input number is even or odd. b) To find whether the number entered is positive or negative.	4
10	5	CO6 CO3	Program to perform different operations on string.	4
11	5	CO3	Program using function(call by value) a) to swap to numbers b) to find square of a given number	4
12	6	CO4 CO6	Program using structure and union a) To store information of 3 students (Name, Roll No, Marks) b) To store information of 2 employees (emp_id, name,salary) and display the details of the employee having salary greater than Rs. 5000.	4
13	7	CO6	Program to compute the sum of all elements stored in an array using pointers	4
14	7	CO4	Program using pointer Arithmetic.	4
15	All	CO3	Mini Project	4
			Total	**60**

E-References:

1 https://www.w3schools.com/ 2 https://www.tutorialspoint.com
3. www.cppinstitute.org/ 4. https://www.programiz.com › c-programming
5. https://www.javatpoint.com › c-programming-language-tutorial
6. https://beginnersbook.com › 2015/02 › simple-c-programs
7. https://www.udemy.com › c-programming-for-beginners

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year of publication	ISBN
1	The C Programming language	Brian W. Kernighan, Dennis Ritchie Prentice Hall	978-0131103627
2	Programming in ANSI C	E. Balgurusamy The Mc-Graw Hill	978-9339219666
3	Let us C	Yashawant Kanetkar BPB Publications	978-9387284494

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	3			1	1	3	1	1
CO2	1		1	2				3	2	1
CO3	2	2			1		1	3	3	
CO4	1		2	2		2		3	2	1
CO5		2		3	2	3	1	2	2	
CO6	1	3	1			2		3		1

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	3			1	1	3	2	
CO2	1		1	2				3	2	
CO3	2	2			1		1	3	3	2
CO4	1		2	2		2		3	2	1
CO5		2		3	2	3	1	3	2	3
CO6	1	3	1			2		3	1	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Vaibhav Wankhade	D.B.A	FIS solutions Pvt Ltd Pune
2	Mr. Mahendra Dabhade	Lecturer in Information Technology	Government Polytechnic, Thane
3	Ms. N. A. Wankhade	Lecturer in Information Technology	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Government Polytechnic Mumbai

(Academically Autonomous Institute of Govt. of Maharashtra)

Information Technology Department

P19 Curriculum

Second Semester

Implemented from July 2019

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
HU19101	Communication Skills	2	2		4	4	60	20	20	25*		25	150
SC19110	Engineering Mathematics	4			4	4	60	20	20				100
IT19204	Digital Techniques	3	2		5	5	60	20	20	25		25	150
CO19203	Computer Hardware and maintenance		4		4	4				50*		50	100
IT19205	Object Oriented Programming using C++ (MOOC)	2	4#		6	6							
CO19204	Data structures	3	2		5	5	60	20	20	25*		25	150
IT19301	Blender (MOOC)		2#		2#	2#							
	Total	**14**	**16**		**30**	**30**	**240**	**80**	**80**	**125**		**125**	**650**
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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

Coordinator
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

Principal

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 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

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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:

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Coordinator,
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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology and Computer Engineering (Sandwich Pattern)**										
Course Code: **IT19204**				Course Title: **Digital Techniques**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1Hr)	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 forms the foundation of computers. This course is introduced with the view that students will become familiar with various digital devices and circuits that are used in microprocessor, microcontroller, computers and other digital systems. It will enable the students to assemble, design, and test logical circuits like multiplexer, demultiplexer, counters, registers etc. This course covers the number systems, logic gates, combinational & sequential logic circuits, analog to digital and digital to analog converters which are important parts of digital systems.

Course Outcomes: Student should be able to

CO1	Perform binary, BCD arithmetic, number conversions and code conversions.
CO2	Understand different logic gates, their symbols, truth tables and pin configuration
CO3	Simplify Boolean expressions using Boolean laws, K map and realize them using logic gates.
CO4	Design various combinational and sequential circuits
CO5	Understand analog, digital signals and their conversions ADC and DAC

Course Content Details:

Unit No	Topics / Sub-topics
1	**Number Systems and codes** 1.1 Introduction to digital signal, Difference between analog signal and digital signal, Advantages of digital systems over analog systems, positive and negative logic 1.2 Concept of base of number system 1.3 Decimal number system 1.4 Binary number system, 1.5 Octal number system 1.6 Hexadecimal number system 1.7 Conversion of one number system to another number system (fractional point numbers) 1.8 Types of codes : BCD, Excess 3, Gray code 1.9 Conversion of Binary to Gray and Gray to Binary

	Course Outcome: CO1, CO5 Teaching Hours :4 hrs Marks: 6 (R- 0, U-2, A-4)
2	**Binary Arithmetic** 2.1 Rules for Binary addition and subtraction 2.2 Concept of 1's and 2's complement of a binary number 2.3 Binary subtraction using 2's complement 2.4 Signed and unsigned binary numbers 2.5 BCD addition and BCD subtraction using 9's & 10's complement (Numericals based on above topic) 2.6 Parity, Definition of even and odd parity **Course Outcome: CO1 Teaching Hours :4 hrs Marks: 6 (R- 2, U-2, A-2)**
3	**Logic Gates:** 3.1 Basic Gates (AND, OR, NOT): circuit of basic gates using discrete components, symbol, truth table, logical expression 3.2 Derived gates (EX-OR, EX-NOR): symbol, truth table and logical expression 3.3 Universal gates (NAND, NOR) : symbol, truth table and logical expression, deriving all gates using universal gates **Course Outcome: CO2 Teaching Hours :4 hrs Marks: 6 (R- 2, U-2, A-2)**
4	**Boolean Algebra:** 4.1 Boolean laws, De Morgan's theorems, 4.2 Simplification of Boolean expression using Boolean laws and De Morgan's theorems. 4.3 Construction of logic circuits using logic gates for Boolean expression 4.4 Concept of SOP & POS, Minterm & Maxterm 4.5 Karnaugh map (K-map) representation of logic function 4.6 Simplification of K-map for 2, 3 and 4 variables with don't care condition 4.7 Realization of reduced expression using logic gates. **Course Outcome: CO3 Teaching Hours :6 hrs Marks: 8 (R- 0, U-2, A-6)**
5	**Combinational Circuits:** 5.1 Design of Half adder and full adder using K-map and realization using gates 5.2 Design of Half subtractor and full subtractor using k-map and realization using gates 5.3 4 bit parallel binary adder (IC7483) 5.4 Code converter using K-map: Binary to Gray code and Gray code to binary (upto 4 bit) 5.5 BCD to seven segment decoder/driver (IC 7447 and IC 7448) 5.6 Comparator: 1 bit, 2 bit (design using K-map and realization using logic gates), 4 bit comparator using IC 7485 5.7 Multiplexer: Necessity of multiplexing, Principle of multiplexing, types of multiplexing 2:1, 4:1, 8:1 and 16:1, multiplexer tree 5.8 Demultiplexer: Necessity of demultiplexing, Principle of demultiplexing, types of demultiplexing 1:2, 1:4, 1:8 and 1:16, demultiplexer tree, concept of decoder **Course Outcome: CO4 Teaching Hours :11 hrs Marks: 14 (R- 2, U-4, A-8)**

6	**Sequential circuits** 6.1 Difference between combinational and sequential circuits 6.2 Basic concept of Flip-flop 6.3 Types of flip flop: SR, JK, D and T flip flops, circuit of SR FF using transistors. Truth table, symbol and operation of all FFs 6.4 Concept of preset and clear inputs 6.5 Race around condition in JK FF, Master slave JK FF 6.6 Triggering methods: Edge trigger and level trigger 6.7 Excitation table of SR, JK, D and T FF 6.8 Counters: basic concept of counters, classification (synchronous and asynchronous counter), concept of Up and Down counter, Modulus of counter(MOD N counter) a. Design of asynchronous up and down counter (3/4 bit) and their timing diagram b. Design of synchronous up and down counter (only 3bits) 6.9 Shift Registers: Definition, classification (SISO, SIPO, PISO, PIPO), their circuit diagram and working, Universal shift register, bidirectional shift register, Ring counter, Twisted ring counter (circuit and timing diagrams) **Course Outcome: CO4 Teaching Hours :12 hrs Marks: 14 (R- 2, U-4, A-8)**
7	**Data Converters** 7.1 Need of data conversion 7.2 Types of data converters ADC and DAC and their specifications 7.3 Circuit diagram and working of R-2R ladder type DAC (mathematical derivation) 7.4 Successive approximation and Ramp type ADC (their block diagram and working) **Course Outcome: CO5 Teaching Hours :4 hrs Marks: 6 (R- 2, 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	**Number Systems and codes**		02	04	06
2	**Binary Arithmetic**	02	02	02	06
3	**Logic Gates**	02	02	02	06
4	**Boolean Algebra**		02	06	08
5	**Combinational Circuits**	02	04	08	14
6	**Sequential circuits**	02	04	08	14
7	**Data Converters**	02	04		06
	Total	**10**	**20**	**30**	**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	3	CO2 CO5	To verify Truth Table of basic gates AND, OR, NOT using ICS.	02
2	4	CO3	To implement given Boolean expression using logic gates.	02
3	5	CO4	To construct Half Adder and Half subtractor & verify the Truth Table	02
4	1, 5	CO1 CO4	To construct binary to gray code converter using gates and verify truth table.	02
5	3	CO2	To verify Truth Table of NAND, NOR, Ex-OR, Ex-NOR gates using ICS.	02
6	4	CO3	To verify De Morgan's theorems	02
7	5	CO4	To construct Full Adder verify the Truth Table	02
8	1, 5	CO1 CO4	To construct gray code to binary code converter using gates and verify truth table.	02
9	3	CO2	To implement basic logic gates using only NAND gates.	02
10	3	CO2	To implement basic logic gates using only NOR gates.	02
11	5	CO4	To construct Full subtractor & verify the Truth table	02
12	6	CO4	To verify truth table of SR and JK FF using ICs.	02
13	6	CO4	To verify truth table of D and T FF using ICs.	02
14	6	CO4	To construct 3 bit ripple counter using Flip Flop and verify its operation	02
15	6	CO4	To construct and test MOD-6 asynchronous counter using IC 7490.	02

Note: Experiments No. 1 to 5 are compulsory. Remaining 5 experiments should be performed as per the 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, Fourth Edition, 2009	978-0070669116
2	Digital Principles and Applications	Malvino A. P. and Leach, Tata McGraw Hill, Education, Seventh Edition, 2011	978-0070141704
3	Digital Electronics: an introduction to theory and practice	William Gothmann, Prentice Hall, Second Edition, 1982	0132122170

E-References:

1. www.electronics-tutorials.ws
2. www.wisc-online.com/learn/technical/electronics-digital
3. www.electricaltechnology.org
4. www.vlab.co.in

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

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

Industry Consultation Committee:

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4	Dr. R. A. Patil (Curriculum Content Designer)	Lecturer in Electronics	Govt. Polytechnic Mumbai

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Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Programme:**Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19203**				Course Title: **Computer Hardware and Maintenance**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs) 30 Mins	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	04	--	04	--	--	--	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 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:

It is hard to imagine our lives without computers. For most of us, the days are few and far between when we do not use our computers to pay bills, play games, surf the internet. Most people need computers to get their professional work done as well. Since computers are such an integral part of our lives, it is crucial that we take care of them by having them properly maintained.

Diploma students must be able to use and maintain computer system and its peripherals. This course will help them know computer hardware basics and to develop basic skills such as assembling PC and troubleshooting its peripherals.

Course Outcomes: Student will be able to

CO1	Identify various types of computer systems with its components and peripherals.
CO2	Demonstrate BIOS settings.
CO3	Partition Hard Disk Drive.
CO4	Troubleshoot common hardware problems.
CO5	Install various operating systems and basic softwares.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Computer Hardware and Devices**:- Desktop Computers, Laptops, Tablets, Mainframe computers, Supercomputers. Features Descriptions:- Hardware components of desktop system, laptop and tablet. Types of Servers, Server features, description and its applications. **Course Outcome: CO1**
2	**Motherboard:-** Components, Layout and Connections. Types and features of motherboard. Enhancing features of motherboard:- adding and replacing components. Troubleshooting problems of motherboard. **Course outcome:CO1CO4**
3	**CPU, BIOS and Power Supply** Processor basic features, Types of Processors,Cache,System Bus. BIOS:- Basic input output system services, BIOS interaction, Date and Time, Password Security, Boot Device Priority. Installing OS. SMPS and UPS importance . **Course Outcome:CO1 CO2 CO5**
4	**Hard Disk Drive:-** Hard Disk Interface:- EIDE, Serial ATA, SCSI, USB and IEEE 1394 (Firewire), RAID, Solid State Drives. Disk Structure:- Head, Tractor, Sector, Cylinders, Cluster, Landing Zone, MBR, Zone Bit Recording. Disk Performance Parameters Characteristics:- Disk access time ,seek and latency time, Data transfer rate. File System:- FAT 16, FAT32, NTFS, RAID Troubleshoot Hard Disk problems. **Course Outcome: CO1CO3**

5	**I/O Devices:-** StudyKeyboard, Mouse, Scanner, Monitor, Printer, Speaker & Mike, LCD Projetor**.** I/O cables :- Specification of I/O cables, Types of I/O cables, Types of I/O Ports. Use of Polycom Soundstation IP. Learn various Preventive Maintenance Techniques. **Course Outcome: CO1**

Suggested Specifications Table (Theory): NA

List of experiments:Total 10-12 experiments(or turns) out of 15-16 experiments(or turns)

Sr. No.	Unit No	CO	Experiments/ Laboratory Activities	Hours
1.	1	CO1	Identify type of desktop and laptop and verify its specifications.	4
2.	2	CO1	Identify various components located on motherboard.	4
3.	3	CO2	Configure BIOS settings.	4
4.	4	CO3	Partitioning of HardDisk.	4
5.	4	CO3	Format HardDisk Drive with various file systems.	6
6.	5	CO1	Connect Keyboard, Mouse, Monitor, Speaker, Microphone.	6
7.	5	CO1	Set LCD Projector.	4
8.	4	CO4	Troubleshoot Hard Disk problems.	6
9.	3	CO5	Install Operating System Windows Family.	4
10.	3	CO5	Install Operating System- Linux	4
11.	3	CO5	Installation of basic software's (Such as MS-Office).	4
12.	3	CO4	Test SMPS.	4
13.	5	CO4	Undertake preventive maintenance by using tools like blower,vacuum cleaner.	6
14.	5	CO1	Case Study:Understand use of Polycom soundstation IP.	4
			Total	64

E-References:

1. https://computer.howstuffworks.com/computer-hardware-channel.htm
2. https://www.youtube.com/results?search_query=how+to+test
3. https://edu.gcfglobal.org/en/subjects/basic-skills/

CO vs.PO and CO vs. PSO Mapping(Computer Engineering)

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

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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code:**CO19204**				Course Title: **Data Structures**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs30m in)	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 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:

The study of Data Structure is essential is essential part of Computer Science. Data structure is a logical and mathematical model for storing and organizing data in a particular way in a computer. The study of data structure helps the students in developing logic and structured programs

Course Outcomes: Student should be able to

CO1	Demonstrate the different data structures.
CO2	Use Stack and recursion concept.
CO3	Implement the Queue concept .
CO4	Use Linked List ,Tree and Graph Concept, Blockchain concepts.
CO5	Implement different Searching and Sorting Techniques.

Course Content Details:`

Unit No	Topics / Sub-topics
1	**Introduction to Data Structures:** **1.1** Need of data structures. **1.2** Definition of Data structure and Abstract data type. **1.3** Classification of Data structures: Linear, non-linear, homogeneous, non-homogeneous, static & dynamic. **Course Outcome: CO1Teaching Hours :6 hrs Marks: 08(R- 02, U-4, A-02)**
2	**Linked List** 2.1 Introduction and Terminologies :Node, Next Address and Pointer, Null pointer, Empty list 2.2 Types of Linked List: Single Linked List, Doubly Linked List, Circular Linked List Doubly Circular Linked List 2.3 Operations on Single Linked List:

	Searching, Insertion - (At Front ,In between and At End), Deletion - (From Front ,In between, From End) 2.4 Blockchain data structure:Introduction to Blockchain, Applications of Blockchain **Course Outcome:CO4 Teaching Hours :10 Marks: 12 (R- 02 , U- 04 , A- 06)**
3	**Stacks** 3.1 Definition & examples of Stack, Stack as an abstract data type implementations using arrays and dynamic memory allocation 3.2 Operations on Stack PUSH POP Top Of The Stack 3.3 Overflow & Underflow of Stack 3.4 Applications of Stack 3.5 Polish Notation 3.6 Reversing a List 3.7 Recursion **Course Outcome: CO2 Teaching Hours : 08 Marks: 08 (R- 02 , U- 04 , A- 02)**
4	**Queue** 4.1 Definition & examples of Queue Queue as an abstract data type implementations using arrays and dynamic memory allocation 4.2 Operations on Queue 4.3 Types of Queue Priority queue Circular queue 4.4 Application Of Queue 4.5 Job Scheduling **4.6** Task Scheduling **Course Outcome:CO3 Teaching Hours :08 Marks: 08 (R- 02 , U- 02 , A- 04)**
5	**Trees and Graphs** 5.1 Introduction and Terminologies : Sub-tree, root ,leaf , left, non-leaf, right, parent, child, ancestor, descendant, brother, level, depth, height. 5.2 Types of Tree General Tree Binary Tree Binary Search Tree 5.3 Representation of Tree 5.4 Operations on Trees Insertion Deletion

	Searching - Depth-first search and Breadth-first search 5.5 Traversing - Pre-order, In-order ,Post-order **5.6** Introduction to GRAPHS Terminologies: graph, node (Vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, weight, path, length. **Course Outcome: CO4 Teaching Hours :10 Marks: 12 (R- 02 , U- 04 , A- 06)**
6	**Searching and Sorting** 6.1 Searching Linear Search, Binary Search , Hash Search. 6.2 Sorting Bubble Sort Insertion Sort Selection Sort Merge Sort Quick Sort **Course Outcome: CO5 Teaching Hours :08 Marks: 12 (R- 02 , U- 04 , 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 Data Structures	02	04	02	08
2	Linked List	02	04	06	12
3	Stack	02	04	02	08
4	Queue	02	02	04	08
5	Trees and Graphs	02	04	06	12
6	Searching and Sorting	02	04	06	12
	Total	12	22	26	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	Write a program for insertion and deletion of an element in an Array at given position.	02
2	2	CO4	Write a program to implement following operations on Singly Linked Lista)Create b)Insertion c)Deletion	02
3	3	CO4	Write a program to implement following operations on Doubly Linked Lista)Create b)Insertion c)Deletion	02
4	4	CO4	In a "Suryan" Shopy multiple Items are available for selling , the store wants to automate the billing system so that the customer gets printed bill .Each Item has unique Id, name and its rate associated with it. Write a menu driven program which will ask the customer to select the Items and quantity of the Items and will generate bill in following format.	02
5	5	CO2	Write a program to implement the PUSH and POP operation of Stack	02
6	6	CO2	Write a program to implement the do and undo activity using Stack	02
7	1	CO2	Write a program to implement Infix Prefix and Postfix Operation	02
8	2	CO3	Write a program to implement different operations on Queue.	02
9	3	CO3	Write a program to implement the concept of Doubly ended Queue.	02
10	4	CO4	Write a program to implement Ticket Reservation of system which is based on following priorities VIP=5,Senior =4,Handicap=3,Ladies=2,General =1	02
11	5	CO4	Write a program to insert and delete nodes in a Tree.	02
12	6	CO4	Write a program to implement Inorder Preorder and Postorder of Tree nodes	02
13	5	CO5	Write a program to implement DFS and BFS.	02
14	6	CO5	Write a program to implement Linear and Binary Search Techniques.	02
15	5	CO5	Write a program to implement a)Quick sort b)Bubble sort c)Insertion d)Selection	02
		Total		**30**

Sr.no	Items	Rate	Quantity			To
Grand Total						

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Data Structure	Seymour Lipschutz , Tata McGraw Hill	10: 0070701989 13: 9780070701984
2	An Introduction to Data Structures with applications	Tremblay, Sorenson,Tata McGraw Hill	0070651507

E-References:

1) https://www.javatpoint.com/data-structure-tutorial
2) https://www.geeksforgeeks.org/data-structures/

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	3	3	2	3	3
CO2	2	2	3	3	1	3	2	2	3	2
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	3	2	3	3
CO5	1	2	3	3	2	3	3	2	3	3
CO6	2	2	3	3	2	3	3	2	3	3

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	3	3	2	3	2
CO2	2	2	3	3	1	3	2	2	3	2
CO3	2	3	3	2	2	2	2	3	2	2
CO4	2	3	2	3	2	3	3	2	3	3
CO5	1	2	3	3	2	3	3	3	3	3
CO6	2	2	3	3	2	3	3	2	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Shubham Shimpi	Analyst	Course5i
2	Mr.Vaibhav Vasani	Assistant Professor	k J. SomaiyaEngg College
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Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, 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 Information Technology (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				
CO19306	Database Management System	3	4		7	7	60	20	20	50*		25	175
IT19206	Data Communication	3	---		3	3	60	20	20				100
CO19303	Programming in Java	3	4		7	7	60	20	20	50*		25	175
IT19207	Microprocessor	3	2		5	5	60	20	20	25		25	150
IT19302	Multimedia Technology	1	2		3	3				25		25	50
HU19102	Environmental Studies		2		2	2					25	25	50
IT19303	PHP & MYSQL (MOOC)		3#		3#	3#							
	Total	**13**	**17**		**30**	**30**	**240**	**80**	**80**	**150**	**25**	**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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

Coordinator
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code:**CO19306**				Course Title: **Database Management Systems**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs30 Min)	TS1 (1 Hr)	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 AR26. 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: Database management system creates, stores, manages a large amount of data which can be used by different software application. In comparison to file processing systems, use of this system increases efficiency of business operations and reduces overall costs. For Developing and managing efficient and effective database applicationsit requires understanding the fundamentals of database management systems, techniques for the design of databases, and principles of database administration. The course focuses on the fundamentals of database management systems and the recent developments.

Course Outcomes:Student should be able to

CO1	Describe fundamental concepts of database.
CO2	Create, manage Database using SQL commands ,Apply different constraints on database
CO3	Develop databases using Entity Relationship modelling approach.
CO4	Apply data normalization and techniques on database
CO5	Maintain transaction processing in Database System.
CO6	Write PL/SQL code for database , create functions and procedures ,apply triggers on database .

Course Content Details:

Unit No	Topics / Sub-topics
1	**Database System Concepts** 1.1 An Introduction to Database: Data, Database, Database Management Systems, advantages of DBMS over file processing system, Applications of DBMS 1.2 Data abstraction, Data dictionary, Instance and schema, 1.3 Data independence-Logical and Physical Independence 1.4 Components of a DBMS and overall structure of a DBMS , Database Users, functions of Database Administrator . 1.5 Data Modeling: Relational , Hierarchical ,Network **Course Outcome: CO1Teaching Hours :6 hrs Marks: 10(R- 4, U-4, A-2)**

2	**Relational Data Model** 2.1 .Basic Concepts of Relational Model- Domain, Attributes, Tuples and Relations 2.2 2.2Codd's rules of RDBMS 2.3 Structured Query Language: Data types in SQL ,DDL, DML ,TCL,DCL. 2.4 Clauses in SQL: Where, Having ,Group by, Order by clauses 2.5 Functions in SQL: Date functions, Time functions, String functions, Aggregate functions 2.6 Concept of Nested Query 2.7 Concept of Join: Equi ,Non-equi ,outer ,self join 2.8 Views Creating , updating , Dropping Views. 2.9 Key Concepts-Super Key, Candidate Key, Primary Key, Foreign Key. 2.10 Integrity Constraints- constraints on a single relation, not null constraint, unique constraint, check constraint, Primary key constraint, Foreign Key constraint. 2.11 Authorization 2.12 Fundamental Relational Algebra Operations: Select , Project , 2.13 Composition of Relational operations: Union ,Set Difference , Cartesian Product Rename . . **Course Outcome: CO2Teaching Hours :12 hrs Marks: 14(R- 4, U-4, A-6)**
3	**Database Design Using E-R Model** 3.1 Data Modeling Using the E-R Model: Entity ,Entity Sets-Weak Strong Entity Set 3.2 Relationship sets, Attributes, Types of attribute ,Mapping Cardinalities, Shortcomings of ER Model. 3.3 Enhanced ER (EER) model: Subclass, super class, Specialization and Generalization 3.4 Case studies: Bank, library, education, organization, hotel management, hospital management. **Course Outcome: CO3Teaching Hours :5hrs Marks: 06(R- 2, U-4, A-)**
4	**Normalization** 4.1 Normalization , Data redundancy and updating anomalies 4.2 Normalization based on Functional dependencies and Multi-valued Dependencies. 4.3 Normal Forms : 1NF, 2NF, 3NF,BCNF **Course Outcome: CO4 Teaching Hours :6 hrs Marks: 10(R- 4, U-4, A-2)**
5	**Transaction Processing** 5.1 Transaction concept: Transaction properties(ACID), Transaction states 5.2 Concurrent Execution of Transactions. 5.3 Schedule : Serial ,Concurrent ,Cascade less Schedule . 5.4 Lock based protocols- Locks, Granting of locks, Lock Based Protocol, **Course Outcome: CO5Teaching Hours : 8hrs Marks: 10(R- 4, U-4, A-2)**
6	**PL/SQL Programming** 6.1 Introduction of PL/SQL, Advantages of PL/SQL, The PL/SQL Block Structure , PL/SQL execution environment , PL/SQL data

	types,Variables,Constants. 6.2 Control Structure: Conditional Control, IterativeControl ,Sequential Control. 6.3 Exception Handling :Predefined Exception ,User Defined Exception. 6.4 Cursor:Implicit and Explicit Cursors,Declaring,Opening and Closing a Cursor, Fetching a record from Cursor, Cursor for loops, parameterized Cursor. 6.5 Functions: Advantage, Creating ,Executing and Deleting a Functions. 6.6 Stored Procedures: Advantage, Creating ,Executing and Deleting a Stored Procedures. 6.7 Database Triggers: Use Of Database Triggers ,How to apply database Triggers, Types of Triggers, Syntax for creating Trigger, Deleting Trigger. **Course Outcome: CO6 Teaching Hours :8 hrs Marks: 10(R- 4, 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	**Database System Concepts**	4	4	2	10
2	**Relational Data Model**	4	4	6	14
3	**Database Design Using E-R Model**	2	4		06
4	**Normalization**	4	4	2	10
5	**Transaction Processing**	4	4	2	10
6	**PL/SQL Programming**	4	4	2	10
	Total	**22**	**24**	**14**	**60**

List of experiments:Total 10-12 experiments(or turns) out of 15-16 experiments(or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Install any open source database Product like My SQL.	2
3	2	CO2	Create a New Database And Perform Following operations on that Database.a)Create table b)Alter the table c)Rename Table d)Drop the table.	4
4	2	CO2	Create a New Database And Perform Following operations on that Databasea)Create a table b)Insert values in that table c)Update the table d) Delete the contents of the table.	4
5	2	CO2	Create a table and apply following clauses on it: Where , Having ,Group by, Order by clauses.	4
6	2	CO2	Implement the following Functions in SQL a) Date functions b) Time functions c) String functions d)	4

			Aggregate functions.	
7	2	CO2	Write SQL code for creating of View Perform Insert ,Modify, Delete records through view, Delete the View. Working with Nested -Query.	4
8	2	CO2	Implementation of all types of Joins.	4
9	2	CO2	Implementation of DCL commands: Grant, Revoke Implementation of TCL commands :Commit, Rollback, Savepoint.	4
10	2	CO2	Create table and Apply constraints such as NOT NULL, UNIQUE, Check, Default, Primary key ,Foreign key, on the table.	4
11	6	CO6	Write a PL/SQL programs using if then else, for, while, nested loop.	4
12	6	CO6	Write a PL/SQL code to implement implicit and explicit cursors.	4
13	6	CO6	Write a PL/SQL programs based on Exception Handling (Predefined and User-defined Exceptions).	4
14	6	CO6	Write a PL/SQL code create Procedures and Functions.	4
15	6	CO6	Write a PL/SQL programs to create triggers on given database.	4
16	6	CO3	Case Study on ER Model And EER Model	2
Total				**60**

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

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Database System concepts	Abraham Silberschtz, Henry Korth& S. Sudarshan, Tata McGraw Hill International	9789332901384
2	Fundamentals of Database Systems"	Elmasri and Navathe Pearson Education	9780136086208 .
3	Database Management Systems	Gupta G. K. McGraw Hill Education, New Delhi 2013,	978-07-107273-1
4	PL/SQL	IvanBayross BPB publication	9788176566919

E-References:

1. https://www.w3schools.com/2.www. google.com
3. https://www.youtube.com/watch?v=IoL9Ve2SRwQ&list=PLIwC9bZ0rmjSkm1VRJROX4vP2YMIf4Ebh

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	3	3	2	3	3
CO2	2	2	3	3	1	3	2	2	3	2
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	3	2	3	3
CO5	1	2	3	3	2	3	3	2	3	3
CO6	2	2	3	3	2	3	3	2	3	3

Industry Consultation Committee:

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Coordinator, Head of Department
Curriculum Development, Department of Computer Engineering
Department of Computer Engineerings

I/C, Curriculum Development Cell Principal

Programme: **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19206**				Course Title: **Data Communication**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30min)	TS1 (1Hr)	TS2 (1Hr)	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 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:

Data communication, which is the transmission of digital data through a network or to a device external to the sending device, is the basis of computer networks. Most of the instruments used in IT can now be connected to the network. The Information technology diploma pass outs are required to handle the data communication related problems. This course examines the important concepts and techniques related to data communication and enables students to have an insight into technology involved to make network communication possible.

Course Outcomes:

Student should be able to:

CO1	Identify process of data communication
CO2	Select relevant types of transmission media depending upon requirements.
CO3	Identify various Multiplexing and Switching techniques used in digital communication.
CO4	Identify types of transmission error and error correction techniques.
CO5	Select components of relevant IEEE standards for wireless communication.

Unit No	Topics / Sub-topics
1	**Introduction to Data Communication** 1.1 Process of data communication and its components: Transmitter, receiver. Medium, Message, Protocol. 1 .2 Protocols, Standards, Standard organizations.

	1 .3 Bandwidth, Data Transmission Rate, Baud Rate and Bits per second. 1 .4 Modes of Communication (Simplex, Half duplex, Full Duplex). 1.5 Analog Signal and Digital Signal, Analog and Digital transmission 1.6 Digital-to-Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying 1.7 Analog-to-analog conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation **Course Outcome:CO1 Teaching Hours :10 Marks: 12 (R-04, U-04, A-04)**
2	**Transmission Media** 2.1 Communication Media: Guided Transmission Media Twisted-Pair Cable, Coaxial Cable Fiber-Optic Cable 2.2 Unguided Transmission Media Radio Waves, Microwaves, Infrared, Satellite 2.3 Line-of-Sight Transmission Point to Point, Broadcast **Course Outcome:CO2 Teaching Hours :10 Marks: 14(R-02, U-04, A- 08)**
3	**Multiplexing and Switching** 3.1 Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time-Division Multiplexing 3.2 Spread spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS) 3.3 Switching: Circuit-switched networks, Datagram networks, Virtual-circuit networks **Course Outcome: CO3 Teaching Hours : 09 Marks: 12(R-02, U-02, A- 08)**
4	**Error Detection and Correction** 4.1 The OSI model Layered Architecture Types of Errors, Forward Error Correction Versus Retransmission Error Detection: Repetition codes, Parity bits, Checksums, CRC Error Correction: Automatic repeat request (ARQ), Error-correcting code 4.2 Framing Fixed-Size Framing, Variable-Size Framing

	4.3 Flow and error control techniques: stop and wait, sliding window, Go-back-n ARQ, Selective Reject ARQ **Course Outcome:CO4 Teaching Hours : 08 Marks: 12 (R-02, U-02, A-08)**
5	**Wireless Communication** 5.1 IEEE wireless Standards: 802.11, 802.1la, 802.11b, 802.1lg, 802.11n, 802.1lac. 5.2 Wireless LANs: 802.11: Architecture MAC Sub layer, Addressing Mechanism 5.3Bluetooth Architecture: Bluetooth Layers, Radio Layer, Baseband Layer The Logical Link Control and Adaptation Layer Protocol (L2CAP),Smart Bluetooth, Near field communication(NFC) 5.4 The Mobile Telephone System First-Generation: Analog Voice Second-Generation: Digital Voice Third-Generation: Digital Voice and Data 5.5 4G and VoLTE, Introduction to 4G and VoLTE, Features of 4G and VoLTE. Next generation mobile communication. **Course Outcome: CO5 Teaching Hours : 08 Marks: 10 (R- 04, U-04, A- 02)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Data Communication	04	04	04	12
2	Transmission Media	02	04	08	14
3	Multiplexing and Switching	02	02	08	12
4	Error Detection and Correction	02	02	08	12
5	Wireless Communication	04	04	02	10
	Total	14	16	30	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Data communications and networking.	Forouzan Behrouz, A Tata McGraw Hill, New Delhi, 2006.	9780-07-296775-3

2	Computer Networks	Andrew s. Tanenbaum PHI Learning, New Delhi, 201 5	978-0-13-212695-3
3	Fundamentals of Business Data Communication	FitzGerald Jerry, Dennis Alan Wiley India Pvt. Ltd. New Delhi, 201 1	9788126521500
4	Data and Computer Communications	Stallings William Pearson Education, I nc.,NJ 07458	0-13-243310-9
5	Data Communication and Networks	Godbole Achyut McGraw Hill, New Delhi, 2006	0070472971

CO VsPO and CO Vs PSO Mapping

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

Industry Consultation Committee:

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1	Mr. Mandar Tawade	Software Development Engineer	Transformhub Mumbai
2	Mrs. Sadaf Shaikh	Lecturer in Information Technology	Government Polytechnic Thane
3	Dr. R. A. Patil	Sel. Grade Lecturer in Electronics	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19303**				Course Title: **Programming in Java**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	**04**	**--**	**07**	**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:

After having sufficient command on structured and object oriented programming in C and C++, Computer Engineering students must learn programming in Java Programming language. Although Java language was developed two decades back, it occupies maximum share of technology in the market due to its continuous and adaptive evolution in the form of versions. Students should make the use of latest features in it such as Web and Mobile Application Development, for better quality of software. In this course, emphasis is given on latest and stable features of Java such as Interfaces, Generics, Lambdas, Collections Framework, Exception Handling, File Handling, I/O, Javadocs, etc. This course is based on the features of Java 8 and above.

Course Outcomes: Student should be able to

CO1	Develop programmes using basic data types, flow control and arrays in Java
CO2	Understand Java classes, interfaces and packages
CO3	Use Generics and Lambda Expressions
CO4	Develop high quality software using Collections Framework and Stream API
CO5	Handle Exceptions, Files and I/O
CO6	Develop Javadocs for their software

Course Content Details:

Unit No	Topics / Sub-topics
1	**Data Types, Flow Control and Arrays** 1.1 public static void main(String[] args) 1.2 Data Types 1.2.1 Primitive Types and Strings

	1.2.2 Literals, Variables and Assignments 1.2.3 Blocks and Variable Scope 1.2.4 Java Operators 1.3 Flow Control 1.3.1 Using if and switch Statements 1.3.2 Using for loop and for each loop 1.3.3 Using while loop and do while loop 1.3.4 Using break and continue 1.3.5 Using Labelled Statements 1.4 Arrays 1.4.1 Defining and Using Arrays 1.4.2 Multidimensional Arrays **Course Outcome: CO1 Teaching Hours : 8 hrs Marks: 10 (R- 2, U-4, A-4)**
2	**Classes, Interfaces and Packages** 2.1 Defining a Class 2.2 Defining and Using Member Fields 2.3 Constructors and Instantiation 2.4 Defining and Invoking Member Methods 2.5 Inheriting Members from Another Class (superclass) 2.6 Defining and Implementing Interfaces 2.7 Overriding and Overloading methods 2.8 Static Fields and Static Methods 2.9 Defining a Package 2.10 Import Declarations 2.11 Access Control **Course Outcome: CO2 Teaching Hours : 8 hrs Marks: 10 (R- 2, U-4, A-4)**
3	**Generics** 3.1 Generic Classes and Interfaces 3.2 Type Parameters vs Type Arguments 3.3 Generic Methods 3.4 Bounded Generics **Course Outcome: CO3 Teaching Hours : 5 hrs Marks: 6 (R- 2, U-4, A-0)**
4	**Lambda Expressions** 4.1 Nested Classes and Inner Classes 4.2 Anonymous Inner Classes 4.3 Default Methods and Functional Interfaces 4.4 Introduction to Lambda Expressions 4.5 Passing Lambda Expressions as Arguments 4.6 Predefined Functional Interfaces

	Course Outcome: CO3 Teaching Hours : 5 hrs Marks: 6 (R- 2, U-4, A-0)
5	**Collections Framework and Stream API** 5.1 Implementing equals, hashcode and toString methods 5.2 The Comparable interface and Comparator interface 5.3 The Collection interface, List interface, Map interface 5.4 Using Lists: ArrayList and LinkedList classes 5.5 Using Maps: HashMap and TreeMap classes 5.6 Stream API 5.6.1 Retrieving a Stream from a Collection 5.6.2 Filtering Streams using filter method 5.6.3 Mapping Streams using map method 5.6.4 Collecting Streams into Collections using collect method 5.6.5 Reducing Streams to values using reduce method 5.6.6 Using forEach method **Course Outcome: CO4 Teaching Hours : 10 hrs Marks: 16(R- 0, U-4, A-12)**
6	**Exceptions, Files and I/O** 6.1 Handling Exceptions 6.1.1 Catching an Exception Using try and catch 6.1.2 Using finally 6.1.3 Propagating Uncaught Exceptions using throws 6.1.4 Defining Exceptions 6.1.5 Throwing Exceptions using throw 6.1.6 Try with resources 6.2 File Handling 6.2.1 Creating a Path 6.2.2 Creating Files and Directories 6.2.3 Using FileWriter and FileReader 6.2.4 Automatically Closing Files 6.2.5 Copying, Moving, and Deleting Files 6.3 I/O 6.3.1 InputStream interface and implementations 6.3.2 OutputStream interface and implementations 6.3.3 System.in and System.out 6.3.4 The java.util.Scanner Class **Course Outcome: CO5 Teaching Hours : 6 hrs Marks: 8 (R- 0, U-2, A-6)**
7	**Javadocs and JVM** 7.1 Introduction to Javadocs 7.2 Overview of JVM 7.3 Using the javac and java Commands 7.4 Garbage Collection

	7.5 Java Version History and Changes in Each Version till the Latest **Course Outcome: CO6 Teaching Hours : 3 hrs Marks: 4 (R- 2, U-2, A-0)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Data Types, Flow Control and Arrays	2	4	4	10
2	Classes, Interfaces and Packages	2	4	4	10
3	Generics	2	4	0	6
4	Lambda Expressions	2	4	0	6
5	Collections Framework and Stream API	0	4	12	16
6	Exceptions, Files and I/O	0	2	6	8
7	Javadocs and JVM	2	2	0	4
	Total	10	24	26	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	**Getting started with Java Application Development using IDE** 1.1 Check whether latest version of java (at least JDK 1.8)is installed or not. If not then download and install it. 1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans IDE 8.1/ Eclipse Neon or later version of IDE 1.3 Create a Java Project/ Application in the IDE 1.4 Create a Java class Person containing two variables name and yearOfBirth of appropriate data types, take inputs from the command line argument, a method to display the name and age of the person. 1.5 Save the project and run it. 1.6 Explore all the features (the menu and shortcuts) of the IDE. Learn about their use.	2
2	1	CO1	2.1 Write a program to print "Hello World". 2.2 Write a program to print addition of two integers. 2.3 Write a program to convert a numeric string into int. 2.4 Write a program to print addition of two integers input from command line arguments.	16

			2.5 Write a program to take two integers from command line, subtract the smaller number from the greater and print the result. 2.6 Write a program to take n integers from command line and print their sum of product (product of first number and last number added to product of second number and second last number and so on). 2.7 Consider any two integers. Write a program to print sum of their squares. 2.8 Write a program to find square root of a given positive integer using Heron's method to find square root. 2.9 Write a program to sort and print the names of students taken from command line in alphabetical order. 2.10 Write a program to print total numbers of vowels and consonants in a given string. 2.11 Given two English words, write a program to check if the first word is anagram of the second word. (An anagram is a word or phrase formed by rearranging the letters of a different word or phrase, typically using all the original letters exactly once. (Example: Anagram of TOM MARVOLO RIDDLE is I AM LORD VOLDEMORT.) 2.12 Write a program to print a missing number in a sorted integer array. 2.13 Write a program to find all the pairs of numbers on an integer array whose sum is equal to a given number.	
3	2	CO2	3.1 Define the following classes/ interfaces with the help of above shortcuts: 1. Person(id, name, dateOfBirth, age, street, city, pin : default and parameterized constructors and setters and getters) 2. Department(id, name, dateOfEstablishment, headOfficeLocation, headId, numberOfEmployees : default and parameterized constructors and setters and getters) 3. Point(x, y, z : default and parameterized constructors and setters and getters) 4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numberOfWheels, vehicleType, model, numberOfSeats : default and parameterized constructors and setters and getters) 5. Laptop(imeiNumber, processorName, processorSpeed, primaryMemoryType, primaryMemoryCapacity, secondaryStorageType, secondaryStorageCapaciry, screenResolution, screenType, isLED, listOfPorts, osInstalled : default and parameterized constructors and setters and getters) 6. interface Taxable(public int cost(), public intpercentGST()) 3.2 Check whether feature of Encapsulation has been followed in 3.1. If not make necessary changes. 3.3 Define classes Car, Train and Truck with necessary member fields, constructors and methods. Make them extend class Vehicle.	14

			3.4 Define a class Gadget with necessary member fields, constrictors and methods. Modify the class Laptop to extend the class Gadget. 3.5 In main method, declare a reference variable vehicle of class Vehicle and create an object of class Car which will be referenced by vehicle. Call getName() method on the object. (Hint: Reference Variable Casting) 3.6 Modify the classes Vehicle and Gadget implement the interface Taxable. Hence override respective methods. 3.7 Modify the classes Car and Laptop to override the implemented methods in 3.6. 3.8 Modify the class Gadget to add a data member gadgetCount such that its value will incremented as soon as a new object is initialized. Create 5 objects of the class Print its value after initializing each object.	
3	2, 3	CO2	4.1 Create a package com.gpm.complex. Create an interface Complex in it with following member methods: realPart(), imgPart(), magnitude() and argument() along with default methods plus(), minus(), into() and divideBy() having appropriate parameters and return types. 4.2 In the same package create class CartesianComplex with real and img and class PolarComplex with r and theta as their member fields. Make the classes implement the Complex interface. Override all non-default methods in the interface. Also override toString(). 4.3 Now in main(), create one objects of both the classes defined in 4.2 and print their addition and multiplication. 4.4 Create a Java swing frame by creating a subclass of javax.swing.JFrame class. Add a java.awt.event.MouseListener by passing an object of an anonymous subclass of java.awt.event.MouseAdapter on the JFrame. Display the coordinates of point at which mouse is clicked.	6
5	5	CO4	Using Stream API implement following programs. 5.1 Write a generic method to count the number of elements in a collection that have a specific property (for example, odd integers, prime numbers, palindromes). 5.2 Write a method which takes a list of words as an argument, groups the words by their lengths and returns the groupings in the form of Map<Integer, List<String>>. (The keys in the map are the lengths and the values are the lists of words of that length.) 5.3 Given a List<List<String>> write a program to convert it into a List<String>. (Hint: Use flatMap method in Stream interface) 5.4 Given: class Album{ public final String name; public final int yearOfRelease; public final List<String> tracks;	14

			}
			class Track{
			public final int rating;
			}
			a) Write a method which takes a list of albums as an argument and returns a list of names of all albums sorted by the year of release.
			b) Write a method which takes a list of albums as an argument and returns a list of names of all albums containing at least one track having rating more than four. The returned list should be sorted by the year of release.	

6	6	CO5	6.1 Create a csv file which will contain 10 integers in a spreadsheet. Read the file using class java.util.Scanner and display the sum of the numbers in the file. Handle all possible exceptions. Write a Java program to create, read and modify a file. 6.2 Create two objects of class Path viz., source and target. Perform the following operations a. Create a file at source b. Copy a file from source to target c. Move a file from source to target d. Delete a file from source e. Retrieve information about source and target.	6
9	7	CO6	Generate complete Javadocs for any two of the above experiments.	2
			Total	**60**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Java™ The Complete Reference Ninth Edition or Later Edition	Herbert Schildt, Oracle Press, 2014	978-0-07-180856-9
2	Java SE 8 for the Really Impatient, 1/e	Horstmann, Pearson Education India; 1 edition (2014)	9332539081 978-9332539082
3	Java 8 in Action, First Edition	Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, Dreamtech Press, 2014	9351197433 978-9351197430

E-References:

1. https://docs.oracle.com/en/java/javase/14/
2. http://www.angelikalanger.com/
3. http://www.angelikalanger.com/GenericsFAQ/JavaGenericsFAQ.html#TOC
4. http://www.angelikalanger.com/Lambdas/TOC.html
5. https://docs.oracle.com/en/java/javase/14/books.html
6. https://docs.oracle.com/en/java/javase/14/language/java-language-changes.html#GUID-B06D7006-D9F4-42F8-AD21-BF861747EDCF
7. https://docs.oracle.com/javase/tutorial/collections/interfaces/list.html
8. https://docs.oracle.com/javase/tutorial/collections/interfaces/map.html

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	1	-	1	3	1	2	2
CO2	1	3	3	2	-	3	3	2	2	3
CO3	1	3	3	2	-	3	3	3	3	3
CO4	-	3	3	2	1	3	3	3	3	3
CO5	-	3	3	2	1	3	3	3	3	3
CO6	3	3	3	1	-	1	3	1	2	2

Industry Consultation Committee:

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2	Mr. Mohan Khedkar	Lecturer in IT	Government Polytechnic, Nashik
4	Ms. Jijnasa S. Patil (Curriculum Content Designer)	Lecturer in Computer Engineering	Government Polytechnic Mumbai

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Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology and Computer Engineering (Sandwich Pattern)**										
Course Code: **IT19207**				Course Title: **Microprocessor**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 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:

Many people throughout the world use laptops, microcomputers, smart phones, digital assistant devices etc. All of these devices utilize a key component: a microprocessor. Microprocessor is brain of all these systems. 8086 is a 16-bit microprocessor. It is the base of all upward developed processors. It is more powerful and efficient computing machine. It overcomes all major limitations of the previous processors. It is able to get interfaced with 8-bit, 16-bit systems. This course covers architecture, signal descriptions and functioning of the 8086 microprocessor. It covers interfacing of memories and input-output devices with microprocessor. It also covers assembly language programming and at the end student will learn to design various microprocessor based systems. This will act as base for the advanced assembly language programming for next generation microprocessors.

Course Outcomes: Student should be able to

CO1	Explain architecture and signal description of 8086.
CO2	Describe the instructions and interrupts of 8086
CO3	Develop assembly language programs for 8086.
CO4	Draw timing diagrams for various instructions
CO5	Interface various memories and I/O devices to 8086 with assembly language programs for interfacing

Course Content Details:

Unit No	Topics / Sub-topics
1	**INTRODUCTION:** 1.1 Introduction to single board microcomputer Block diagram of microcomputer Elements of microcomputer

	Different type of Buses: Address, data and control bus Types of Programming Languages and their comparison. 1.2 Evolution of microprocessor 1.3 Limitations of 8 bit microprocessor **Course Outcome: CO1 Teaching Hours :2 hrs Marks: 4 (R- 2, U-2, A-0)**
2	**MICROPROCESSOR 8086:** 2.1 Features/Specifications of microprocessor 8086 2.2 Architecture of 8086 2.3 Register organization of 8086, concept of pipelining 2.4 Memory Segmentation, 20 bit physical address generation 2.5 Pin configuration and signal description of 8086 2.6 Minimum mode of 8086, address/data demultiplexing 2.7 Maximum mode of 8086 **Course Outcome: CO1 Teaching Hours :8 hrs Marks: 14 (R- 6, U-8, A-0)**
3	**INSTRUCTION SET OF 8086:** 3.1 Machine language instruction format 3.2 Addressing modes of 8086 3.3 Instruction set of 8086 3.3.1 Data transfer instructions 3.3.2 Arithmetic and logical instructions 3.3.3 Control transfer or branching instructions 3.3.4 String manipulation instructions 3.3.5 Processor control instructions 3.3.6 Bit manipulation instructions 3.3.7 Iteration control instructions 3.4 Assembler Directives **Course Outcome: CO2 Teaching Hours :9 hrs Marks: 8 (R- 2, U-6, A-0)**
4	**ASSEMBLY LANGAUGE PROGRAMMING OF 8086:** 4.1 Assembler Elements of assembly language programming, Overview of assembly process, Single Pass assembler, Two pass assembler 4.2 Linker and loader 4.3 Opcode (machine code) generation **(no question in theory examination on this topic)** 4.4 Assembly language programming of 8086 Addition, Subtraction, Multiplication, Division, Sum of series of numbers, Smallest and largest number from array, Sorting numbers in ascending and descending order, Block transfer etc. 4.5 Concept of Procedure and Macros, Reentrant and Recursive procedure **Course Outcome: CO3 Teaching Hours :10 hrs Marks: 14 (R- 0, U-0, A-14)**

5	**TIMING DIAGRAMS AND INTERRUPTS** 5.1 Memory, I/O read and memory, I/O write timing diagram in Minimum mode 5.2 Memory, I/O read and memory, I/O write timing diagram in Maximum mode 5.3 Interrupts of 8086, hardware/software interrupts **Course Outcome: CO4, CO2 Teaching Hours :6 hrs Marks: 8 (R- 0, U-4, A-4)**
6	**MEMORY AND I/O INTERFACING** 6.1 Interfacing techniques: Memory mapped I/O, I/O mapped I/O 6.2 Address generation and decoding techniques 6.3 Interfacing of memories (RAM, ROM, EPROM) 6.4 Interfacing of 8255 6.5 Interfacing of I/O devices LEDs, Seven segment display, ADC, DAC, Stepper motor. (ALP for interfacing of above devices) **Course Outcome: CO5 Teaching Hours :10 hrs Marks: 12 (R- 0, U-0, A-12)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction**	02	02		04
2	**Microprocessor 8086**	06	08		14
3	**Instruction set of 8086**	02	06		08
4	**Assembly language programming of 8086**			14	14
5	**Timing diagrams and interrupts**		04	04	08
6	**Memory and I/O interfacing**			12	12
	Total	**10**	**20**	**30**	**60**

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

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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	CO1	Understand 8086 development board and simulation software	02
2	4	CO2 CO3	8086 Assembly language programming for Addition and subtraction of two 16 bit numbers	02
3	4	CO2 CO3	8086 Assembly language programming for Addition of series of 16 bit numbers	02

4	4	CO2 CO3	8086 Assembly language programming for multi byte addition of two numbers	02
5	4	CO2 CO3	8086 Assembly language programming for multiplication of two 16 bit signed and unsigned numbers	02
6	4	CO2 CO3	8086 Assembly language programming for division of two 16 bit signed and unsigned numbers	02
7	4	CO2 CO3	8086 Assembly language programming for arranging 16 bit numbers in ascending order.	02
8	4	CO2 CO3	8086 Assembly language programming for arranging 16 bit numbers in descending order.	02
9	4	CO2 CO3	8086 Assembly language programming for block transfer of 16 bit data.	02
10	6	CO4 CO5	Interface LEDs to 8086 and develop, simulate an assembly language program to get effect of dancing light.	02
11	6	CO4 CO5	Interface seven segment display to 8086 and develop, simulate an assembly language program to display numbers from 1 to 9 on it.	02
12	6	CO4 CO5	Interface stepper motor to 8086 and develop program to rotate motor in clockwise direction.	02
13	6	CO4 CO5	Develop and simulate assembly language program for Traffic controller.	02
14	6	CO4 CO5	Interface ADC to 8086 and write ALP for it.	02
15	6	CO4 CO5	Interface DAC to 8086 and write ALP to generate square and triangular waveforms.	02

Note: Experiments No. 1, 3, 6, 11, 12 and 15 are compulsory. Remaining 4 experiments should be performed as per the importance of the topic.

References/ Books:

Sr. No.	Book Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Advanced Microprocessor and Interfacing	Badri Ram, McGraw Hill Education; Error edition; July 2017	978-0070434486
2	8086 Microprocessor: Programming and Interfacing the PC	Kenneth Ayala, Delmar Cengage Learning; First edition , January 1995	978-0314012425
3	Advanced Microprocessor and Peripherals	A. K. Ray, K. M. Bhurchandi: Tata McGraw Hill Education, Third Edition 2013	978-1259006135
4	Microprocessor & interfacing (Programming & Hardware)	Douglas Hall; : Tata McGraw Hill Education, Second Edition 1992	978-0070257429

E-References:

1. www.tutorialspoint.com/microprocessor/microprocessor_8086_overview.htm
2. www.javatpoint.com/8086-microprocessor
3. www.geeksforgeeks.org/architecture-of-8086/
4. nptel.ac.in/courses/108/103/108103157/

CO Vs PO and CO Vs PSO Mapping

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

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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code:**IT19302**				Course Title: **Multimedia Techniques**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH	TS1	TS1	PR	OR	TW	Total
01	**02**	**-**	**03**	**-**	**-**	**-**	**25***	-	**25**	**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:

For effective communication teaching, presentation multimedia is the essential feature. The Multimedia Techniques course is designed for using multimedia technology to enhance their professional skills to pursue a career in multimedia. The course focuses on specialized technical & creative skills & provides students with reflective skills. It also offers students' knowledge in theories & methodologies relevant to current industry professional practice & research.

Course Outcomes: Student should be able to

CO1	Explain different multimedia elements
CO2	Demonstrate use of different Compression, Decompression techniques
CO3	Create animations with different tools such as FLASH,MAYA
CO4	Demonstrate the use of animation, sound, video control and scanned Images
CO5	Describe multimedia Authoring System

Course Content Details:

Unit No	Topics / Sub-topics
1	**Multimedia Elements:** 1.1 Evaluation of multimedia systems: Multimedia elements, Photographic Images, Geographic's information system maps, Still image processing 1.2 Categorization of Multimedia 1.3 Storage media: Magnetic media technology, Hard disk technology, RAID, Optical media. 1.4 Multimedia applications: Document imaging, OCR, Handwrite recognize Non textual image, Digital video application & Electronic message **Course Outcome:CO1** **Teaching Hours : 3**

2	**Compression/Decompression & File Formats** 2.1Compression and decompression: Types, Need of data compression and Still video image. 2.2Video compression technique: Simple compression technique, Interpolative, Predictive. 2.3 JPEG Compression: Definition, JPEG Components and Standards 2.4 File Formats: RIF,TIFF MIDI file format, AVI format Introduction to MPEG and WAV file format **Course Outcome:CO2** **Teaching Hours : 2**
3	**Multimedia I/O Technology :Audio, Video Digitalization** 3.1 Multimedia System Architecture 3.2 Basics of Digital Audio: Signal-to-Noise-Ratio(SNR),Signal-to-Quantization-Noise-Ratio(SQNR) 3.3 Color use in Image & Video: Color Characteristics, Color models in Images and video. 3.4 Fundamentals Concepts in video: Types of video signals ,Components of video, Composite video, s-video, Analog and Digital video **Course Outcome:CO3** **Teaching Hours : 3**
4	**Animation: Multimedia Tool-1 Flash** 4.1Introduction to multimedia tool & versions of flash 4.2creating and Modifying elements: Line, Text, Pen tool, different shapes 4.3 Selecting lines fill with arrow tool, using lasso tool, Selecting and deselecting elements, Modifying created objects. 4.4Keyframes,timelines,Tweening Motion and Layers 4.52D versus 3D Animation. 4.6Advertisement in flash, Use & Application of flash animation software. **Course Outcome:CO4** **Teaching Hours : 2**
5	**Graphics multimedia tool-2 Photoshop & Maya** 5.1 Concept of processing digital images. 5.2 File formats and versions of Photoshop. 5.3 Application and Use of Photoshop. 5.4Tools:Cropping & Slicing, Measuring and Navigation, Selection Typing, Video Editing. 5.5 Introduction to Corel Draw. 5.6 Introduction about VFX, its advantages and applications. 5.7 Introduction to MAYA Tool: Overview, Components MAYA Embedded Languages, System Requirements. **Course Outcome:CO4** **Teaching Hours : 3**
6	**Multimedia Authoring And User Interface** 6.1 Multimedia Authoring system and its types. 6.2 Hypermedia Application and Design Consideration. 6.3 User Interface Design 6.4 Object Display/Playback Issue. 6.5 Introduction to Distributed Multimedia Systems.

	Course Outcome:CO5	**Teaching Hours : 2**

List of experiments: Total 10 experiments (or turns) out of 13 experiments (or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	Classify & Analyze Characteristics, functionality and performance of different multimedia Input Output devices.	02
2	1	CO2	Demonstrate compression & decompression, different file formats	02
3	2	CO2	Design advertisement in flash with animation.	02
4	3	CO2	Develop a presentation using play, pause, stop button instances using Action Script 2.0	02
5	3	CO2	Create a presentation by using different tools in flash(Lasso, Arrow and etc)	02
6	3	CO2	Design a joker character in flash.	02
7	3	CO2	Develop an animation of joker's face by using key frames and Tween Motion(Laughing and Crying)	02
8	4	CO2	Design and develop a forest tree with flowers and fruits from a small plant using different layers & Frame Transition Time.	02
9	4	CO3	Insert audio to relevant frames that has lightning and Rain effect.	02
10	5	CO3	Create Images by using Photoshop tool.	02
11	5	CO3	Create Animation using MAYA Tool.	02
12	5	CO4	Create any project in MAYA using rendering effect.	04
13	3,4,5	CO4	Mini Project: Students should create a movie of minimum 5 minutes using Flash & Maya or Adobe Animate CC software.	04
		Total		**30**

References/ Books:

Sr.No	Title	Author	Publication
1	Multimedia System Design	Prabhat K Andheigh,Kiran Thakrar	Prentice Hall of India
2	Multimedia Systems	Koegel Buford	Pearson Education
3	Micromedia flash For windows & Macintosh	Katherine Ulrich	Pearson Education
4	Multimedia Communication	R.Steimnetz,K.Nahrstedt	Pearson Education

Web References:

- **https://www.tutorialspoint.com/listtutorials/flash**

- **http://www.nptel.ac.in/courses/106102065/33**
- **http://www.adobe.com/in/products/animate.html**
- **https://www.autodesk.in/products/maya/overview**

CO Vs PO and CO Vs PSO Mapping

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

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Head of Department
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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in CE/ME/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						
TH	PR	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 (Mechanical Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
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 (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

GOVERNMENT POLYTECHNIC MUMBAI

(Academically Autonoums Instititute, Government of Maharashtra)

Teaching and Examination Scheme(P19)

With effect from AY 2019-20

Programme: Diploma in Information Technology (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				
CO19206	Operating System	3	2		5	5	60	20	20		25*	25	150
CO19308	Advance Programming in Java	2	4		6	6				50*		50	100
IT19304	Microcontroller & Embedded systems	3	2		5	5	60	20	20	25*		25	150
IT19401 Optional1	Python Programming	3	2		5	5	60	20	20	25*		25	150
CO19311 Optional 1	Next Generation Databases												
CO19305	Computer Networks	3	2		5	5	60	20	20		50*		150
CO19207	Software Engineering	3	---		3	3	60	20	20				100
IT19305	User Interface Design	1	2		3	3				25*		25	50
IT19306	Linux OS (MOOC)		3#		3#	3#							
	Total	**18**	**17**		**35**	**35**	**300**	**100**	**100**	**125**	**75**	**150**	**850**

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 assessment, #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- 2hours, Creative Activity-2 hours

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

Coordinator
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19206**				Course Title: **Operating System**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	**02**	**--**	**05**	**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 test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

An Operating system is the basic system software that makes a computers system operational. It acts an interface between the user and the computer system. It is the essential software that manages computer hardware and software resources and provides common services for computer programs. Operating system is a core technology subject, it familiarizes the students with the concepts, structure and functions of Operating System.This course is aimed to teach and practice the concept of Operating System design.

Course Outcomes: Student should be able to

CO1	Demonstrate basic knowledge about operating system
CO2	Identify various OS components, services & structure
CO3	Describe the concept of Process and Threads
CO4	Apply various CPU Scheduling Algorithm, Use Banker's algorithm to find the Safe State for processes
CO5	Estimate efficiency of various memory management techniques
CO6	Illustrate File allocation and access methods

Course Content Details:

Unit No	Topics / Sub-topics
1	**Operating System Overview** 1.1 Introduction To Operating System : Concept, Components Of Computer System 1.2 Role Of The Operating System 1.3 Different Types Of Operating Systems- Batch Operating System, Multiprogramming System, Multitasking Operating System, Time Shared System, Multiprocessor Systems, Cluster

	Systems, Distributed Systems, Real Time Systems, Open Source Operating System, Mobile Operating System **Course Outcome: Co1 Teaching Hours : 5 Hrs Marks: 06 (R- 2, U-4, A-00)**
2	**Operating System Components & Structure** 2.1. Operating System Components: Process Management, Main Memory Management, Secondary Storage Management, I/O System Management, File Management. 2.2. Operating-System Services 2.3. Operating System Structure: Simple Structure, Layered, Monolithic, Microkernel 2.4. System Calls - Concept, Types & Uses of System Call: Process Control, File Management, Device Management, Information Maintenance, Communication. **Course Outcome: CO2 Teaching Hours : 08 Hrs. Marks: 10 (R-2 , U-4 , A-4)**
3	**Process Management** 3.1. Process-Concept, Process States, Process Control Block 3.2. Process Scheduling- Scheduling Queues, Schedulers, Context Switch. 3.3. Inter-Process Communication- Introduction, Shared Memory System & Message Passing System 3.4. Threads – Benefits, Users And Kernel Threads 3.5. Multithreading Models – Many To One, One To One, Many To Many **Course Outcome: CO3 Teaching Hours : 06hrs. Marks: 08 (R-4 , U-4 , A-00)**
4	**CPU Scheduling & Deadlock** 4.1 Scheduling Objectives, Concept, CPU And I/O Burst Cycles, Pre-Emptive & Non- Pre-Emptive Scheduling, Scheduling Criteria. 4.2 Types Of Scheduling Algorithms –First Come First Served (FCFS), Shortest Job First (SJF), Shortest Remaining Time (SRTN), Round Robin (RR), Priority Scheduling, Multilevel Queue Scheduling 4.3 Deadlock: System Model, Necessary Conditions Leading To Deadlocks 4.4 Deadlock Handling 4.5 Deadlock Prevention 4.6 Deadlock Avoidance: Safe State, Resource Allocation Graph 4.7 Bankers Algorithm And Example: Data Structure Of Banker's Algorithm, Safety Algorithm, Resource-Request Algorithm, Illustrative Examples **Course Outcome: CO4 Teaching Hours : 10 Hrs. Marks: 14 (R-2 , U-4 , A-8)**
5	**Memory Management** 5.1. Background – Basic Memory Hardware, Address Binding, Logical& Physical Address Space, 5.2. Swapping 5.3. Contiguous Memory Allocation, Fragmentation. 5.4. Paging, Page Table, Page Fault, Segmentation 5.5. Virtual Memory – Concept, Demand Paging. 5.6. Page Replacement Algorithms- First In First Out (FIFO), Least Recently Used (LRU), Optimal Page Replacement, Not Recently Used (NRU). **Course Outcome: CO5 Teaching Hours :10 Hrs. Marks: 14 (R-4 , U-4 , A-6)**

6	**File System** 6.1 File – Concepts, Attributes, Operations, Types, File System Structure, 6.2 Access Methods – Sequential, Direct, Swapping 6.3 File Allocation Methods- Contiguous , Linked, Indexed 6.4 Directory Structure – Single Level, Two Level **Course Outcome: CO6 Teaching Hours :06 Hrs. Marks:08 (R-4 , U-4 , A-00)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Operating System Overview**	2	4	--	**06**
2	**Operating System Components & Services**	2	4	4	**10**
3	**Process Management**	4	4	--	**08**
4	**CPU Scheduling & Deadlock**	2	4	8	**14**
5	**Memory Management**	4	4	6	**14**
6	**File System**	4	4	--	**08**
	Total	**18**	**24**	**18**	**60**

List of experiments: Total 10-12 experiments(or turns) out of 15-16 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	**Compare various operating systems according to different criteria** • **Operating systems to be considered** - MS-DOS, Windows selected versions, OS/2, Mac OS, Windows 10, Linux, Android, iOS, etc. • **Criteria-** Creator/ Produced by, Initial Public release, Target system type, Computer Architecture supported, File system supported, Kernel type, GUI default , Package management, Update management, Native APIs, Non-native APIs supported through subsystems, etc.	2
2	2	CO2	Write a program using interrupt to clear the screen.	2
3	3	CO3	Use of Window's Task Manager to monitor the System Performance	2

<table>
<tr><td>4</td><td>4</td><td>CO4</td><td>Write a program to implement First Come First Serve Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput.(Given the list of Processes, their CPU burst times)
<table><tr><th>Process</th><th>Burst Time</th></tr><tr><td>P1</td><td>6</td></tr><tr><td>P2</td><td>8</td></tr><tr><td>P3</td><td>7</td></tr><tr><td>P4</td><td>3</td></tr></table>(Course Teacher may give different Processes & Burst Times to students)</td><td>2</td></tr>
<tr><td>5</td><td>5</td><td>CO5</td><td>Write a program to implement First in first out (FIFO) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. (Course Teacher may give different reference Strings to students)
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6</td><td>2</td></tr>
<tr><td>6</td><td>6</td><td>CO6</td><td>Use /Differentiate various File Managers application software for Windows & Linux</td><td>2</td></tr>
<tr><td>7</td><td>2,3</td><td>CO2, CO3</td><td>Write a program to demonstrate use of Process Control system calls.</td><td>2</td></tr>
<tr><td>8</td><td>4</td><td>CO4</td><td>Write a program to implement Bankers Algorithm. Determine need matrix and Safety sequence for following system including 5 processes p0,p1,p2,p3,p4 and three resource types A,B ,C
<table><tr><th rowspan="2">Process</th><th colspan="3">Resource Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr><tr><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr><tr><td>P0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td><td>3</td><td>3</td><td>2</td></tr><tr><td>P1</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P2</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P3</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P4</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td><td></td><td></td><td></td></tr></table>(Course Teacher may give different problems to students)</td><td>2</td></tr>
<tr><td>9</td><td>4</td><td>CO4</td><td>Write a program to implement Shortest Job First Scheduling Algorithm. Calculate average waiting time, average turnaround time and throughput.(Given the list of processes, their CPU burst times and arrival times)</td><td>2</td></tr>
<tr><td>10</td><td>4</td><td>CO4</td><td>Write a program to implement Shortest Remaining Time First Scheduling/ Round Robin (RR)/ Priority Scheduling/ Multilevel Queue Scheduling Algorithm. Algorithm.Calculate average waiting time, average turnaround time and throughput.(Given the list of processes, their CPU burst times and arrival times/ Priorities)</td><td>2</td></tr>
<tr><td>11</td><td>2</td><td>CO2</td><td>Write a program which acts as a chat application between two users on the same computer, using shared memory concept.</td><td>2</td></tr>
<tr><td>12</td><td>5</td><td>CO5</td><td>Write a program to implement Least recently used (LRU) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory</td><td>2</td></tr>
</table>

			frames. (Course Teacher may give different reference Strings to students) 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6	
13	5	CO5	Write a program to implement Optimal page replacement (OPT) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. (Course Teacher may give different reference Strings to students) 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6	2
14	5	CO5	Write a program to implement Not recently used (NRU) Page replacement algorithm. Calculate number of page fault and page fault rate for following reference string sequence and 3 memory frames. (Course Teacher may give different reference Strings to students) 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6	2
15	2,6	CO2, CO6	Write a program to demonstrate use of file management system calls.	2
		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 as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Operating System Concepts	Abraham Silberschatz, Greg Gagne, Peter B. Galvin Wiley India Limited 10th Edition, April 2018	ISBN: 978-1-119-32091-3/ ISBN: 978-1-119-75313-1
2	Operating Systems: Internals and Design Principles	William Stallings Pearson Education, India, 9th Edition, March 2018	ISBN-13: 9789332518803
3	Modern Operating Systems	Andrew S. Tanenbaum, Herbert Bos, Prentice Hall of India 4th Edition, September 2014	ISBN:1292061421 (ISBN13: 9781292061429)
4	Operating system	Godbole Atchyut S. Tata McGraw-Hill Education, 3rd Edition, 2015	ISBN-13: 9780070702035
5	Operating system	D. M. Dhamdhere Tata McGraw-Hill Education, 3rd Edition, 2015	ISBN-13 9781259005589

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1. https://www.javatpoint.com/os-tutorial
2. https://courses.cs.vt.edu/csonline/OS/Lessons/Processes/index.html
3. http://pages.cs.wisc.edu/~bart/537/lecturenotes/titlepage.html
4. http://www.cs.kent.edu/~farrell/osf03/oldnotes/
5. https://en.wikipedia.org/wiki/Operating_system
6. https://www.computerhope.com/jargon/o/os.htm
7. https://computer.howstuffworks.com/operating-system.htm

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	--	1	--	2	--	2	--	--	2
CO2	2	--	1	--	2	--	2	--	--	2
CO3	2	3	3	3	3	2	2	2	3	2
CO4	2	3	3	3	3	2	2	2	3	2
CO5	2	3	3	3	3	2	2	2	3	2
CO6	1	--	1	--	2	--	2	--	--	2

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	--	1	--	2	--	2	--	--	2
CO2	2	--	1	--	2	--	2	--	--	2
CO3	2	3	3	3	3	2	2	2	2	2
CO4	2	3	3	3	3	2	2	2	3	2
CO5	2	3	3	3	3	2	2	2	3	2
CO6	1	--	1	--	2	--	2	--	--	2

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms. Bhakti R. Khajone	Senior Project Engineer	WIPRO Technology, Pune
2	Mrs. Poonam Vegurlekar	Lecturer in Computer Engg.	Thakur Polytechnic Mumbai
3.	Smt Varsha M Aswar	I/C HOD Computer Engg. Dept.	Govt. Polytechnic Mumbai
4.	Smt. Prajakta S. Sadafule	Lecturer in Computer Engg	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19308**				Course Title: **Advanced Programming in Java**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
02	**04**	**--**	**06**	**--**	**--**	**--**	**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 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 makes students learn higher level application programming using Java and make the use of latest features in it for better quality of software. This course includes Concurrency, Fork/ Join Framework, Network Programming, Java Remote Method Invocation, web development in Java using Servlet and JSP technology, advanced web development using Hibernate and Spring Frameworks.

Course Outcomes: Student should be able to

CO1	Develop concurrent programs using Fork/ Join Framework.
CO2	Develop networking applications in Java using UDP and TCP/IP Sockets
CO3	Develop applications using Remote Method Invocation
CO4	Develop web applications using Servlets and JSP
CO5	Develop web applications such as Hibernate and Spring Frameworks

Course Content Details:

Unit No	Topics / Sub-topics
1	**Concurrency** 1.1 SOLID Principles in Java 1.2 Thread Class and Runnable Interface 1.3 Creating a thread 1.4 Thread.sleep Method 1.5 Wait, notify and notifyAll Methods 1.6 ThreadPool and ExecutorService 1.7 ForkJoin Framework 1.8 Collection.parallelStream Method

	Course Outcome: CO1 Teaching Hours : 5 hrs
2	**Networking** 2.1 The Networking Classes and Interfaces 2.2 InetAddress: Inet4Address and Inet6Address 2.3 TCP/IP Client Sockets 2.4 URL and URLConnection 2.5 HttpURLConnection 2.6 The URI Class 2.7 Cookies 2.8 TCP/IP Server Sockets 2.9 Datagrams: DatagramSocket, DatagramPacket Classes **Course Outcome: CO2 Teaching Hours : 4 hrs**
3	**Java Remote Method Invocation** 3.1 The RMI Architecture and Factory Design Pattern 3.2 Stub and Skeleton 3.3 The Remote Interface 3.4 Naming Remote Objects, 3.5 Implementation class 3.6 RMIClient and RMIServer 3.7 Client Server Application Development using RMI **Course Outcome: CO3 Teaching Hours : 4 hrs**
4	**Servlets** 4.1 Creating Java Web Application Project in IDE 4.2 Structure of Java Web Application Project 4.3 Web Servers, Application Servers, Database Servers 4.4 Configuring a Java Web Application 4.4.1 The configuration file: web.xml 4.4.2 Tags in web.xml 4.5 Deploying a Java Web Application 4.6 What Is a Servlet?, Servlet Lifecycle, Sharing Information 4.7 Creating and Initializing a Servlet 4.8 Writing Service Methods 4.9 Filtering Requests and Responses 4.10 Invoking Other Web Resources 4.11 Accessing the Web Context 4.12 Maintaining Client State 4.13 Finalizing a Servlet 4.14 Uploading Files with Java Servlet Technology 4.15 Asynchronous Processing 4.16 Nonblocking I/O 4.17 Protocol Upgrade Processing **Course Outcome: CO4 Teaching Hours : 5 hrs**

5	**Java Server Pages** 5.1 Creating a Java Web Application Project for JSP 5.2 Creating a simple JSP Page 5.3 Using 'out' and Page Directives 5.4 JSP expressions, variables, and declarations 5.5 JSP-generated servlet 5.6 Implicit Objects 5.7 The JSP Life Cycle 5.8 Scriptlets: What and Why Not? 5.9 useBean, setProperty and getProperty Methods **Course Outcome: CO4 Teaching Hours : 4 hrs**
6	**Persistence using Hibernate Framework** 6.1 Creating the Database 6.2 Creating the Web Application Project with Hibernate 6.3 Modifying the Hibernate Configuration File 6.4 Creating the HibernateUtil.java Helper File 6.5 Generating Hibernate Mapping Files and Java Classes 6.6 Creating the FilmHelper.java Helper Class 6.7 Creating the JSF Managed Bean 6.8 Creating the Web Pages 6.9 Running the Project 6.10 Downloading the Solution Project 6.11 Troubleshooting **Course Outcome: CO5 Teaching Hours : 4 hrs**
7	**Spring Web MVC** 7.1 Setting up a New Project with Spring Web MVC Support 7.1.1 Creating a Spring Web MVC Skeleton Project 7.1.2 Running the Skeleton Project 7.2 Overview of the Application 7.3 Implementing a Service 7.4 Implementing the Controller and Model 7.5 Implementing the Views **Course Outcome: CO5 Teaching Hours : 4 hrs**

List of experiments: (**Note: 1. Mini Project is to be performed in parallel with the unit containing chosen topic. No separate time is allotted for Mini Project. 2. Use of IDE is mandatory.**)

Sr. No.	Unit No	COs	Title of the Experiments	Hours

1	1	CO1	**Blurring for Clarity (Basic Use of Fork/ Join Framework)**
			
			Write code that performs a segment of the work. Your code should look similar to the following pseudocode:
			`if (my portion of the work is small enough)`
			`  do the work directly`
			`else`
			`  split my work into two pieces`
			`  invoke the two pieces and wait for the results`
			Wrap this code in a java.util.concurrent.RecursiveAction subclass. (java.util.concurrent.RecursiveAction class extends java.util.concurrent.ForkJoinTask class.)
			After your RecursiveAction subclass is ready, create the object that represents all the work to be done and pass it to the invoke() method of an instance of java.util.concurrent.ForkJoinPool class.
			
			1.1 Write a code to blur an image. The original source image is represented by an array of integers, where each integer contains the color values for a single pixel. The blurred destination image is also represented by an integer array with the same size as the source.
			1.2 Performing the blur is accomplished by working through the source array one pixel at a time. Each pixel is averaged with its surrounding pixels (the red, green, and blue components are averaged), and the result is placed in the destination array. Since an image is a large array, this process can take a long time. Use concurrent processing on multiprocessor systems by implementing the algorithm using the fork/join framework.
			1.3 Write an appropriate code in main method to test the output.
				10

2	2	CO2	**Client Server Programming in Java** 2.1 Develop a Java Application in which TCPClient will send a text message and TCPServer will receive it. 2.2 Add a functionality to the Java Application in 2.1 using which TCPServer will send a text message and TCPClient will receive it. 2.3 Add a functionality to the Java Application in 2.2 using which TCPServer will advertise the TCPCLients associated with it.	8
3	3	CO3	**Java Remote Method Invocation** 3.1 Create a distributed application using RMI where the client will handshake with the server by invoking the remote method	8

			public void sayHello() where client and server are on different hosts in the same network. 3.2 Create a distributed application using RMI, where an RMI client can download a text file from the RMI server. Also identify the design pattern being used.	
4	4	CO4	**Web Application Development using Servlet** 4.1 Create a Java Web Application in an IDE. 4.2 Create a client side HTML web page to input your name from textbox and display "Hello <your name>" on the servlet after clicking on the "Login" button. 4.3 Display the server port and protocol number in the browser in scrolling from right to left format. 4.4 Create an HTML page login.html and create two textboxes on the HTML page named userName and password. After clicking on the 'Login' button the servlet will be displayed. It will show 'Login Successful' when userName and password are same else 'authentication failure' will be displayed. 4.5 Create two HTML pages userProfile.html and errorPage.html. Modify 5.4 as follows: In case of successful login redirect to the page userprofile.html and display the username passed from login.html page on it.. In case of Authentication Failure redirect to errorpage.html.	10
5	5	CO4	**Web Application Development using JSP** 5.1 Create a Java Web Application in an IDE. 5.2 Create a JSP page registerEmployee.jsp for Employee Registration. The page will take inputs as First Name, Middle Name, Last Name, Email ID, Mobile No., Street, City, Pin code, Hire Date, Manager, Qualification, Designation and Experience. The page will also have a Submit button clicking on which all the inputs will be displayed on the userProfile.html page. 5.3 Modify registerEmployee.jsp in 6.2 to store the inputs in the 'employees' table you have created in the database in 3.2. 5.4 Create a Java Bean EmployeeBean with the properties given in 5.2. 5.5 Modify registerEmployee.jsp to use theuseBean, getProperty and setPropety.	8
6	6	CO5	**Using Hibernate in a Web Application** 6.1 Create a Database in any open source database like MySQL or Oracle. 6.2 Create a Web Application Project with Hibernate. 6.3 Modify the Hibernate Configuration File 6.4 Create the HibernateUtil.java Helper File 6.5 Generate Hibernate Mapping Files and Java Classes 6.6 Create the FilmHelper.java Helper Class 6.7 Create the JSF Managed Bean 6.8 Create the Web Pages 6.9 Run the Project 6.10 Download the Solution Project 6.11 Troubleshooting	8

7	7	CO6	7.1 **Setting up a New Project with Spring Web MVC Support** a. Create a Spring Web MVC Skeleton Project in IDE b. Running the empty Skeleton Project and see the output. 7.2 **Implementing a Service** a. Create a Java class for implementing a service e.g. orderAPizza(), generaeBill(), etc. 7.3 **Implementing the Controller and Model** a. Use a SimpleFormController to handle user data and determine which view to return. 7.4 **Implementing the Views** a. Create two JSP pages. The first, which you will call `nameView.jsp`, serves as the welcome page and allows users to input a name. The other page, `helloView.jsp`, displays a greeting message that includes the input name. Begin by creating `helloView.jsp`	8
8	All	All	**Mini Project** Students are required to make groups of two and develop a mini project which is using at least 2 of the given technology in the course contents. For example, 1. Fork/ Join Framework 2. Client Server Application TCP/ IP or UDP 3. RMI Client Server Application 4. Web Application using Servlet and Hibernate 5. Web Application using JSP and Hibernate 6. Web Application using Spring Web MVC and Hibernate.	--
				Total **60**

E-References:

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2. https://docs.oracle.com/javase/tutorial/essential/concurrency/forkjoin.html
3. https://docs.oracle.com/javase/tutorial/essential/concurrency/QandE/questions.html
4. https://docs.oracle.com/javase/tutorial/networking/overview/networking.html
5. https://docs.oracle.com/javase/7/docs/platform/rmi/spec/rmiTOC.html
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7. https://docs.oracle.com/en/middleware/fusion-middleware/weblogic-server/12.2.1.4/wbapp/basics.html#GUID-41C6F1CE-5E16-49CC-9623-70C4199FFD9F
8. https://docs.oracle.com/javaee/7/tutorial/jsf-page.htm
9. http://hibernate.org/
10. https://netbeans.org/kb/docs/web/hibernate-webapp.html
11. https://spring.io/projects/spring-framework
12. https://netbeans.org/kb/docs/web/quickstart-webapps-spring.html

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

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

Industry Consultation Committee:

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1	Ms. Varshali Cholake-Landge	Senior Software Engineer	Volkswagen IT Services India Pvt. Ltd.
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Coordinator,
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Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology and Computer Engineering (Sandwich Pattern)**										
Course Code:**IT19304**				Course Title: **Microcontroller and Embedded system**						
Compulsory / Optional: **Compulsory for IT and Optional for CO**										
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:

Microcontroller is heart of all domestic, industrial, consumer goods and other high end products. Automation in every field of life is being used and microcontroller is inbuilt element of these systems and devices. 8051 microcontroller architecture, peripheral interfacing to it and assembly language programming is covered in this course. Microcontroller is inbuilt element of embedded system. This course will also cover the concepts of embedded system. It covers Arduino and its programming.

Course Outcomes: Student should be able to

CO1	Comprehend the architecture and signal description of 8051.
CO2	Develop the program for 8051 for the given operations.
CO3	Interpret the program by using timer, interrupt and serial port/parallel port.
CO4	Interface various input and output devices to microcontroller.
CO5	Comprehend the concept of embedded systems, aurdino and its programming.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Basics of Microcontroller 8051:** 1.1 General architecture of Microcontroller 1.2 Comparison of Microprocessor and Microcontroller 1.3 Architecture of 8051 1.4 Pin configuration and signal description of 8051 1.5 Memory Organization of 8051 1.6 Special features of 8051- Boolean Processor, Power saving options- idle and power

	down mode, Derivatives of 8051(8951, 8952, 8031, 8751). **Course Outcome: CO1 Teaching Hours :8hrs Marks: 10 (R- 4, U-6, A-0)**
2	**8051 Instruction set and Programming** 2.1 Instruction set (Data transfer, Aritmatic and Logical, Branching, Machine control, stack operation, Boolean) 2.2 Addressing modes 2.3 Assembly language programming 2.4 8051 programming in C **Course Outcome: CO2 Teaching Hours :10hrs Marks: 14 (R- 0, U-0, A-14)**
3	**Timer, Interrupts, Serial and Parallel communicaion** 3.1 8051 Timer/Counter: Logic and Modes, Programming of 8051 timer 3.2 8051 Interrupts: Interrupts and polling, SFRs- IE, IP, Priority level and interrupt sequence 3.3 Serial Communication: SCON, SBUF, Modes of serial communication, Programs on serial communication 3.4 Parallel communication: I/O port structure and its programming **Course Outcome: CO3 Teaching Hours :8hrs Marks: 8 (R- 0, U-4, A-4)**
4	**Memory and I/O Interfacing** 4.1 Memory Interfacing: Interfacing of external program and data memory, Address map table 4.2 I/O Interfacing: Interfacing of LEDs, Relays, Keyboard, Seven segment display, LCD, Stepper motor, DC motor, ADC 0808, DAC 0808 4.3 Applications of 8051 Square wave generation using port pins of 8051 Triangular wave generation using DAC Water level controller Temperature controller using ADC Stepper motor control for clockwise and anticlockwise rotation Traffic light controller Programming can be in assembly language or C (student's choice) **Course Outcome: CO4 Teaching Hours :10hrs Marks: 14 (R- 0, U-0, A-14)**

5	**Introduction to embedded systems** 5.1 Block diagram of embedded system with hardware components. 5.2 Harvard and Von Neumann architecture, RISC and CISC processors 5.3 Characteristics of embedded system, Processor power, memory, operating system, reliability, performance, power consumption, unit cost size, flexibility, 5.4 Classification of embedded system **Course Outcome: CO5 Teaching Hours :4hrs Marks: 4 (R- 2, U-2, A-0)**
6	**Open source embedded devlopment board (Arduino)** 6.1 Arduino Birth, Open source community 6.2 Functional block diagram of Arduino 6.3 Functions of each pin of Arduino 6.4 I/O functions,Looping techniques, Decision making techniques. 6.5 Programming of an Arduino Interfacing LEDs, Seven segment display, LCD, ADC, DAC, Stepper motor, DC Motor. Various applications using Arduino. **Course Outcome: CO5 Teaching Hours :5hrs Marks: 10 (R- 0, U-4, A-6)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Basics of Microcontroller 8051**	4	6	0	10
2	**8051 Instruction set and programming**	0	0	14	14
3	**Timer, Interrupts, Serial and Parallel communication**	0	4	4	08
4	**Memory and I/O interfacing**	0	0	14	14
5	**Introduction to Embedded systems**	2	2	0	04
6	**Open source embedded development board (arduino)**	0	4	6	10
	Total	**06**	**16**	**38**	**60**

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

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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	Identify various blocks of 8051 microcontroller development board	02
2	2	CO2	Write an assembly language program to perform arithmetic operations such as addition, subtraction, multiplication and division	02
3	2	CO2	Write an ALP to find smallest/largest numbers from the given data bytes stored in internal/external data memory locations	02
4	2	CO2	Write an ALP to arrange numbers in ascending/descending order. Write a C program for the same task.	02
5	3,4	CO3 CO4	Interface LED with microcontroller and turn it ON for 1 sec. Write program either in C or assembly language.	02
6	3	CO3	Develop an ALP to generate pulse and square wave by using timer delay.	02
7	4	CO4	Interface 7 segment display to 8051 and display numbers 0 to 9 on it.	02
8	4	CO4	Interface 4X4 keyboard matrix with 8051 and display the key pressed on 7 segment display	02
9	4	CO4	Interface stepper motor to 8051 and write a program to rotate in clockwise and anticlockwise direction for given angles.	02
10	6	CO5CO6	Control the speed of DC motor using Arduino.	02
11	6	CO5CO6	Implement line follower robot using Arduino.	02
12	6	CO5CO6	Implement water level controller using Arduino	02
13	6	CO5CO6	Implement Digital Thermometer using Arduino	02
14	6	CO5CO6	Interface 4x4 keyboard matrix and 16x2 LCD to Arduino	02
15	6	CO4CO5	Interface DAC to 8051 and write ALP to generate square and triangular waveforms.	02

Note: Experiments No. 1, 3, 6, 11, 12 and 15 are compulsory. Remaining 4 experiments should be performedas per the importance of the topic.

References/ Books:

Sr. No.	Book Title	Author, Publisher, Edition and Year Of publication	ISBN
1	The 8051 Microcontroller and Embedded Systems: Using Assembly and C	Mazidi, Pearson Education India; 2 edition 2007	978-8131710265
2	The 8051 Microcontroller & Embedded Systems Using Assembly and C with CD	Kenneth Ayala, Delmar Cengage Learning; First edition , January 2010	978-8131511053
3	Introduction to Embedded System	Shibu K. V., MC Graw Hill, First edition, 2009	978-1259081514
4	Beginning Arduino	Michael McRoberts, Technology in action, First edition 2010	978-1430232414
5	Programming Arduino Getting started with sketches	Simon monk, MC Graw Hill, First edition, 2012	978-0071784238

E-References:

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2. www.elprocus.com/8051-microcontroller-architecture-and-applications/
3. www.javatpoint.com/embedded-system-8051-microcontroller-architecture
4. http://index-of.es/Varios-2/Programming%20Arduino.pdf
5. http://www.digimat.in/nptel/courses/video/108105102/L31.html
6. https://www.arduino.cc/en/Tutorial/BuiltInExamples

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

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

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	
CO2	3	2	3	3	3			2	3	
CO3	3	3	3	3	3		3	2	2	1
CO4	3	2	3	3	3		3	1	3	2
CO5	3	3	3	3	3	3	3	2	2	1

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Head of Department
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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code:**IT19401**				Course Title: **Python Programming**						
Compulsory / Optional: **Optional**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 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 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:

Python is powerful programming language. It has efficient high level data structure and a simple but effective approach to object oriented programming. Python code is simple,short, readable, intuitive and powerful and thus it is effective for introducing computing and problem solving to beginners. It's elegant syntax and dynamic typing together with its interpreted nature make it ideal language for scripting and rapid application development in many areas and most platforms.

Course Outcomes: Student should be able to

CO1	Perform different operation on data structures in python with decision making and functions
CO2	Apply object oriented concept in python programming.
CO3	Perform file handling with exceptions.
CO4	Validate the fields using regular expression
CO5	Design GUI forms and Database connectivity

Course Content Details: `

Unit No	Topics / Sub-topics
1	**Introduction to Python** 1.1 Features of python 1.2 Python building blocks: Identifiers ,Keywords , Indention ,Variables ,Comments 1.3 Python Environment setup: Installation and working on IDE. 1.4 Python Data Types: Number, String, Tuple, Array, List, Dictionary Declaration and use

	of data types. 1.5 Basic Operations: Arithmetic ,Comparison/Relational ,Logical ,Assignment , Bitwise ,Membership ,Identity Operator **Course Outcome: CO1 Teaching Hours: 05 Hrs Marks: 10(R-02, U-02, A-06)**
2	**Decision Making and Functions** 2.1 decision making statements(if ….elif…else , Nested if) 2.2 looping statement(for ,while) 2.3 Loop Manipulation using continue, break, pass statements 2.4 Functions 2.5 Use Of Python Built –in -Functions: type/data conversion functions, Maths Functions **Course Outcome:CO1 Teaching Hours :10Hrs Marks: 10 (R-02, U-04, A-04)**
3	**Object Oriented Programming in Python** **3** .1 Creating a Class 3.1.1 Self Variables 3.1.2 Types of Methods 3.2 Constructors 3.3 Inheritance 3.4 Polymorphism 3.6.1 Operator Overloading 3.6.2 Method Overloading & Overriding 3.5 Exception Handling 3.7.1 Errors in a Python Program 3.7.2 Exceptions 3.7.3 Types of Exceptions 3.7.4 The Except Block 3.6 Introduction to Multithreading. **Course Outcome: CO2 Teaching Hours : 10Hrs Marks: 10 (R-04, U-04, A-02)**
4	**File Handling** 4.1 Types of Files in Python 4.2 Opening a File 4.3 Closing a File

	4.4 Knowing Whether a File Exists or Not 4.5 Working with Binary Files 4.6 Appending Text to a File 4.7 Understanding read functions, read(), readline() and readlines() 4.8 Understanding write functions, write() and writelines() 4.9 Manipulating file pointer using seek 4.10 File Exceptions **Course Outcome:CO3 Teaching Hours : 05Hrs Marks: 8 (R-02, U-04, A-02)**
5	**Python Regular Expressions** 5.1 Powerful pattern matching and searching 5.2 Power of pattern searching using regex in python 5.3Password, email, url validation using regular expression **Course Outcome: CO4 Teaching Hours :05Hrs Marks: 10(R-02, U-04, A-04)**
6	**GUI Programming and Databases** 6.1 GUI Programming: 6.1.1Writing a GUI with Python 6.1.2 GUI Programming Toolkits 6.1.3 Creating GUI Widgets with Tkinter 6.1.4 Creating GUI using Turtle 6.1.5 Creating Layouts, Radio Buttons and Checkboxes, Dialog Boxes. 6.5 Database Access: 6.5.1 Python's Database Connectivity 6.5.2 Types of Databases Used with Python 6.5.3 Mysql database Connectivity with Python 6.5.4 Performing Insert, Deleting & Update operations on database **Course Outcome: CO5 Teaching Hours :10Hrs Marks:12(R-02, U-04, 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 Python**	2	2	6	**10**
2	**Decision Making and Functions**	2	4	4	**10**
3	**Object Oriented Programming in Python**	4	4	2	**10**
4	**File Handling**	2	4	2	**08**
5	**Python Regular Expressions**	2	4	4	**10**
6	**GUI Programming and Databases**	2	4	6	**12**
	Total	**14**	**22**	**24**	**60**

List of experiments :Total 12 experiments (or turns) out of 20 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Write python programs to understand Expressions, Variables, Basic Math operations, Strings: Basic String Operations & String Methods. (Minimum four Programs based on math operations, Strings)	2
2	2	CO2	Develop programs to understand the control structures of python (minimum 4 programs on decision making and looping) 1.Armstrong Number 2. factorial number 3. Array calculations 4.even odd number OR any other suggested by teacher	2
3	3	CO2	Write python programs to understand classes and objects. (minimum 2 programs to create classes and objects)	2
4	4	CO3	Write python programs to understand different File handling operations 1.Create a file 2. Copy contents from one file to another file.	2
5	5	CO4	Develop programs to validate the fields using regular expressions in python.	2
6	6	CO5	1. Develop programs to learn GUI programming using Tkinter 2. Develop a program to draw different shapes on Canvas using Tkinter	2
7	1	CO1	Develop programs to learn different types of structures and operations on (list, dictionary, tuples, arrays) in python.	2

			1.add 2.delete 3.merge 4.sort 5.membership operator	
8	2	CO1	Develop a python programs for function 1.Returing result from a function 2.Returing multiple values from a function (minimum 4 similar programs for practice)	2
9	2	CO1	Develop a program for Functions are First class objects 1.Assign function to a variable 2.to define one function inside another function 3. to pass a function as parameter to another function 4. a function can return another function	2
10	2	CO1	Develop a program for 1.pass by value or call by value 2. pass by reference or call by reference 3. Types of arguments 4.lambda Functions	2
11	3	CO2	Write a python program to implement multiple inheritances.	2
12	5	CO4	Develop a program for validating the fields in file using regular expression	2
13	6	CO5	Draw graphics using Turtle.	2
14	6	CO5	Develop a program to add different Widgets on Frame 1.Button 2.Label 3.Message/text 4.Scrollbar 5.Checkbutton	2
15	6	CO5	Write python programs to understand database connectivity	2
		Total		**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Core Python Programming	Dr.R.Nageswara Rao 2017 Edition Dreamtech Press.	978-93-5119-942-7
2	Python: The Complete Reference	Martin C Brown , McGraw Hill Publication	9780072127188
3	Learning Python	Mark Lutz, David Ascher , O'Reilly Publication	ISBN-13 :978-0-596-00281-7

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

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Coordinator,
Curriculum Development,
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Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19311**				Course Title: **Next Generation Databases**						
Compulsory / Optional: **Compulsory for Computer Engineering** **Optional for Information Technology**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	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 test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

A key component of information systems is its database management system. This course encompasses the study of advance technologies in database. It introduces a non-relational database solution to work with semi-structured or unstructured data. This course helps students enhance their skills & competencies to implement database systems using advanced technologies.

Course Outcomes: Student should be able to

CO1	Understand the concept of non-relational database system.
CO2	Execute different MongoDB operations on database.
CO3	Execute different methods and advanced MongoDB operations on collection.
CO4	Configure MongoDB cluster on Cloud.
CO5	Understand the concept of Distributed database Systems.

Course Content Details:

Unit No	**Topics / Sub-topics**
1	**Non-relational database system** 1.1 Relational (RDBMS) Vs. Non-relational database system (NoSQL). • Structured vs. unstructured data. 1.2 Introduction to NoSQL**.** 1.2.1 Types of NoSQL. • Key-value database. • Column Oriented database. • Graph Oriented database. • Document Oriented database. 1.3 CAP theorem. 1.4 BASE properties. 1.5 Benefits of NoSQL 1.6 Applications of Non-Relational databases.

	Course Outcome: CO1 Teaching Hours :06 Marks:10 (R-06, U-04,A-)
2	**Introduction to MongoDB** 2.1 MongoDB overview. • Mongo Shell • Features of MongoDB. • RDBMS concepts mapping to MongoDB. • BSON and JSON document formats. 2.2 MongoDB Data types 2.3 Basic operations in MongoDB • Create and Drop Database. • Create and Drop Collection. 2.4 MongoDB CRUD Operations • Create • Read • Update • Delete 2.5 MongoDB Data Modeling and data relationships • Embedded document. • Reference document. • Querying Embedded documents. 2.6 Arrays • Querying Array elements.
	Course Outcome: CO2 Teaching Hours :13 Marks:16 (R-04, U-04,A-08)
3	**Advanced MongoDB** 3.1 Methods in MongoDB • Projection • Skip • Limit • Sort • Save • Gridfs 3.2 Indexing • Types of Index • Covered queries 3.3 Aggregation Framework • Pipeline operations • MapReduce 3.4 CAPPED Collection 3.5 Replication- Replica Set Configuration, Components of Replica Set

	3.6 Sharding 3.7 Database backup and Restore **Course Outcome: CO3 Teaching Hours :12 Marks:16 (R-04, U-04,A-08)**
4	**Hosting MongoDB on Cloud** 4.1 Introduction to Cloud database. 4.2 Benefits of Cloud database/DBaaS 4.3 MongoDB Atlas • Deployment of Free Cluster using MongoDB Atlas. • Cluster Configuration. • Connect Cluster to Mongo Shell. • Access and modify database on Cloud through Mongo Shell. **Course Outcome: CO4 Teaching Hours :05 Marks:08 (R-04, U-04,A-)**
5	**Distributed databases** 5.1 Introduction • Distributed database system vs. Centralized database system. 5.2 Features 5.3 Classification • Homogeneous DDBMS • Heterogeneous DDBMS 5.4 Architectural models of DDBMS • Client –Server architecture • Peer to Peer architecture • Multi DBMS (MDBS) architeccture 5.5 Distributed data storage techniques 5.5.1 Fragmentation: Horizontal, Vertical, Hybrid 5.5.2 Replication 5.6 Applications of Distributed databases. **Course Outcome: CO5 Teaching Hours :09 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	**Non-Relational Database System**	06	04	-	10
2	**Introduction to MongoDB**	04	04	08	16
3	**Advanced MongoDB**	04	04	08	16
4	**Hosting MongoDB on Cloud**	04	04	-	08
5	**Distributed Databases**	02	04	04	10
	Total	**20**	**20**	**20**	**60**

List of experiments: Total 10-12 experiments (or turns) out of 15-16 experiments (or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	Installation of MongoDB.	02
2	2	CO2	2.1 Create Database and Collections in MongoDB. 2.2 Perform CRUD-Create, Read, Update and Delete operations on created collections.	04
3	3	CO3	Implementation of different MongoDB methods on document: Projection, Skip, Limit, Sort and Save.	04
4	4	CO4	Host MongoDB on Cloud: • Create MongoDB Atlas account. • Create a new Cluster. • Configure Cluster. • Create Database users. • Connect created cluster with Mongo Shell	04
5	5	CO5	Perform fragmentation operation on database.	02
6	2	CO2	Create a Collection containing embedded documents and arrays. Perform CRUD operations on created Collection.	02
7	3	CO3	Store any mp3 file using Gridfs method.	02
8	3	CO3	8.1 Execute aggregate functions on collection. 8.2 Implement pipeline operations on collection.	04
9	3	CO3	9.1 Create different types of Index on Collection: Simple/Single index, Compound index, Multikey index. 9.2 Execute Covered queries on Collection.	02
10	3	CO3	Execute commands to create database backup and to restore data.	02
11	3	CO3	Perform Replication operation on database.	02
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 as per importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	MongoDB- The Definitive Guide	Kristina Chodorow, O'Reilly, May 2013	ISBN: 978-1-449-34468-9
2	Data Modeling for MongoDB	Steve Hoberman, Technics Publications	9781634620413
3	Principals of Distributed Database Systems.	M. Tamer Ozsu; Patrick Valduriez, Springer	

E-References:

1. www.MongoDB.com 2. www.w3resource.com 3. https://docs.oracle.com

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

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

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

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

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Coordinator,
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Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme: **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code:**CO19305**				Course Title: **Computer Networks**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**2**	**--**	**5**	**60**	**20**	**20**	**--**	**50***	**--**	**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 test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale: In today's age of Technology many applications send information from one place to another place. Computer network organizes this information in such a way that it can be sent anywhere over wide geographical area and output remote information at a push of button. This indicates the type of networks used. Here we study basic concept of networking, its applications, topologies, network devices, protocol used, OSI reference model, TCP/IP model, IP addressing and various types of the communication protocols.

Course Outcomes: Student should be able to

CO1	Classify types of Computer Networks.
CO2	Classify different transmission medias and switching techniques.
CO3	Identify network devices and describe their functions.
CO4	Compare and explain OSI reference and TCP/IP models
CO5	Explain functions of various protocols in TCP/IP model.
CO6	Configure Wired and Wireless LAN.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Basics of Computer Network** 1.1Introduction to Computer Network: Definition of Computer network, sharing information, sharing resources, file sharing. 1.2 Categories of Network: Based on scope - LAN, MAN, WAN .Based on Connection - Peer to Peer network, Client- Server Network, Centralized network, Distributed network. 1.3 Network Architecture:-Features and Applications 1.4 Applications and Benefits of Computer Network. **Course Outcome: CO1Teaching Hours :06 hrs Marks:08(R- 2, U-4, A-2)**
2	**Transmission Media and Switching** 2.1 Communication Media : Guided Transmission Media :Twisted pair cable,Coaxial cable,Fibre optic cable.2.2 Unguided Transmission Media : Radio waves,Microwaves,Infrared,Satellite. 2.3 Line-of-Sight Transmission : Point to point ,Broadcast. 2.4 Multiplexing: Frequency Division Multiplexing,Time division Multiplexing.

	2.5 Switching : Circuit Switched networks, Packet Switched Networks. **Course Outcome:CO2Teaching Hours :04 hrs Marks: 08(R- 2 , U- 4 ,A-2)**
3	**Network Topologies and Devices** 3.1 Network Topologies : Introduction, Definition,Selection Criteria,Types of Topologies – Bus,Ring,Star,Mesh,Tree,Hybrid. 3.2 Network Connecting Devices: NIC (Network Interface Card),Hub,Switch,Router,Repeater,Bridge,Gateway,Modem,Wireless infrastructure Components. **Course Outcome:CO3Teaching Hours : 04 hrsMarks: 06 (R- 2 , U- 4)**
4	**Network Reference Models** 4.1 OSI Reference Model : Layered Architecture ,Peer-to-Peer Processes,Interfaces between layers,Protocols,Organization of layers,Functions and features of each layer. 4.2 TCP/IP Model : Layered Architecture,Organization of layers,Functions and features of each layer. 4.3 Comparisionbetween OSI Model and TCP/IP Model. **Course Outcome:CO4Teaching Hours :12 Marks: 14 (R-4 , U- 6 , A-4)**
5	**TCP/IP Protocols** 5.1Network Access/Link layer protocols :Ethernet, Token Ring,, Network access to Internet layer Mapping: ARP and RARP protocol 5.2 Internet Layer: IP Protocol, IP Address, Classful and Classless Addressing, IPV4 and IPV6 protocol.DHCP Protocol,Network Address Translation(NAT) protocol, ICMP protocol. 5.3 Transport Layer : Connection Oriented and Connection less service,TCP and UDP protocol. 5.4 Application Layer Protocols : HTTP,HTTPS,SMTP ,SNMP,TELNET,DNS and FTP protocol. **Course Outcome:CO5Teaching Hours :12 Marks: 14 (R- 4 , U- 6 , A- 4)**
6	**Wired and Wireless LAN** 6.1 Wired LAN : Ethernet,Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet,Ethernet IEEE standard 802.3,Bridged Ethernet,Switched Ethernet ,Full Duplex Ethernet. 6.2 Multiple Access Random Access : ALOHA,CSMA,CSMA/CD,CSMA/CA 6.3 Wireless LANs : wireless communication system, Bluetooth Architecture,Bluetooth layers connecting LANs , Wi-Fi Architecture ,Wi-Fi connecting LAN, Introduction to Li-Fi. **Course Outcome:CO6Teaching Hours :07 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	Basics of Computer Network	2	4	2	8
2	Transmission Media and Switching	2	4	2	8
3	Network Topologies and Devices	2	4	--	6
4	Network Reference Models	4	6	4	14
5	TCP/IP Protocols	4	6	4	14
6	Wired and Wireless LAN	2	4	4	10
	Total	**16**	**28**	**16**	**60**

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,3	CO1,CO3	Identify components of Network and study Local Area Network in your Lab.	2
2	2	CO2	Draw network layout and type of topology used for computer lab networking.	2
3	2	CO2	Create network cable by crimping the straight and cross CAT 5 cables and test it using CableTester	2
4	3	CO3	Install Network Interface card and locate MAC address of computer.	2
5	6	CO6	Connect computers in Network using given topology with wired media	2
6	6	CO6	Connect computers using Wireless Media	2
7	3	CO1,CO3	Sharing files , folders and Printer in a Network.	2
9	3	CO1,CO3	Connect your system to the Internet.	2
10	5	CO5	Configure Static and dynamic IP addresses	2
11	6	CO6	Install and Configure Wireless LAN using Wi-fi and configure hotspot.	2
12	5	CO5	Execute basic Networking commands : Ping,ipconfig,tracert,netstat,route.	2
13	5	CO5	Install Wireshark and configure as Packet Sniffer.	2
14	1,3,5	CO1,CO3, CO5	Identify and troubleshoot the problem in any non functioning LAN.	2
15	All	All	Arrange Industrial visit to observe Networking and Resource sharing.	---
16	All	All	Mini Project to be completed by group of 3 or 4 students	4
		Total		**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Data Communication and Networking	Behrouz , Forouzan TMH 1999	ISBN-13: 978-0073376226
2	Computer Networks	Tanenbaum Fourth edition	**ISBN** 13: 9780132126953
3	Computer Networking: A Top-Down Approach (6th Edition)	Kurose and Ross	**ISBN**-13: 978-8131790540
4	Data Communication and Networking	Godbole Achyut	**ISBN**-13: 978-0071077705

E-References:

1. https://ndl.iitkgp.ac.in/ 2.www.tutorialspoint.com
3. www.nptel.com4. www.udemy.com
5. www.netacad.com

CO VsPO and CO Vs PSO Mapping (Computer Engineering)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	1	2	3	2	2
CO2	3	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	2	2	2	3	2	2
CO4	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	2	2	2	3	3	3
CO6	2	3	3	2	2	2	2	3	2	3

CO VsPO and CO Vs PSO Mapping (Information Technology)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	1	2	2	1	1
CO2	3	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	2	2	2	3	2	2
CO4	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	2	2	2	3	3	3
CO6	2	3	3	2	2	2	2	3	2	3

Industry Consultation Committee:

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Principal

Programme:**Diploma in Computer Engineering and Information Technology(Sandwich Pattern)**										
Course Code: **CO19207**				Course Title: **Software Engineering**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs) 30 Mins	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	**--**	**--**	**03**	**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 test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Software Engineering is an engineering discipline that is concerned with all aspects of software production. Further it is the systematic application of scientific and technological knowledge, methods, and experience to the design, implementation, testing, and documentation of software. This +course intends to develop a systematic, disciplined approach to the development, operation, and maintenance of software and help students to get acquainted with latest trends in Software Engineering.

Course Outcomes: Student should be able to

CO1	Understand the basics of Software Engineering.
CO2	Identify suitable process model for software development.
CO3	Understand importance of Agile Methodology.
CO4	Apply Software Engineering principles at various stages of Software Development.
CO5	Use software modelling to create data designs.
CO6	Apply project management principles for software development.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Overview of Software Engineering** 1.1 Definition of Software 1.2 Software Characteristics, Software Applications ,Software myths 1.3 Types of Software 1.4 Software Engineering- Definition, Need 1.5 Software Engineering- A Layered Approach 1.6 Software Development Generic Process Framework- Typical Umbrella Activities. Identifying A Task Set. 1.7 Some Terminologies ● Product and Process ● Module and Software Components ● Deliverables and Milestones **Course Outcome: CO1 Teaching Hours :07 Marks: 10 (R- 6, U-2, A-2)**
2	**Process Models** 2.1 Personal and Team Process Models (PSP and TSP) 2.2 Waterfall Model 2.3 V Model 2.4 Incremental Process Model 2.5 Evolutionary Process Model: Prototyping 2.6 Selection criteria for software process model. **Course Outcome:CO2 Teaching Hours :06 Marks: 08 (R-2 , U-4 , A-2)**
3	**Agile Methodology** 3.1 Agile Software Methodology: ● What is Agile Methodology ● Importance of Agile Methodology ● Difference between Prescriptive and Agile Process Model ● Agility Principles 3.2 Adaptive Software Development 3.3 Agile Process Model: Scrum ScrumProcess Flow 3.4 Dynamic Systems Development Method (DSDM) 3.5 Introduction to DevOps 3.6 JIRA **Course Outcome:CO3 Teaching Hours : 08 Marks:10 (R- 2 , U- 4 , A-4)**
4	**Software Requirement Engineering** 4.1 Software Engineering Practices and its importance, Core principles. 4.2 Communication Practices, Planning Practices, Modelling Practices , Construction Practices, Software Deployment(Statement and meaning of each principle) 4.3 Requirement Engineering: Requirement Gathering and Analysis,

	Types of Requirements (Functional, Product, organizational, External Requirements), Eliciting Requirements, Developing Use cases, Building requirement models, Requirement Negotiation, Validation. 4.4 Software Requirement Specification: Need of SRS, Format, and its Characteristics. **Course Outcome: CO4 Teaching Hours :07 Marks:10 (R-2 , U-4 , A- 4)**
5	**Software Modelling and Design** 5.1 Translating Requirement Model into Design Model: Data Modelling. 5.2 Analysis Modelling: Elements of Analysis model. 5.3 Design Modelling: Fundamental Design Concept (Abstraction, Information hiding, Structure, Modularity, Concurrency, Verification, Aesthetics) 5.4 Design Notations: Data Flow Diagram (DFD), Structured Flowcharts and Decision Tables 5.5 Testing- Meaning and purpose, Testing methods-Black-box and White-box, Level of Testing-Unit Testing, Integration Testing ,User Acceptance Testing 5.6 Test Documentation- Test Case Template, Test plan, Introduction to defect report, Test Summary Report **Course Outcome: CO5 Teaching Hours : 10 Marks:12 (R-4 , U-4 , A- 4)**
6	**Software Project Management** 4.1 The management spectrum-4P's 4.2 Metrics for Size Estimation: Line of Code (LoC), Function Points (FP). 4.3 COCOMO (Constructive Cost Model) 4.4 Risk Management: Risk Identification, Risk Assessment, RMMM Strategy. 4.5 DevOps testing methods. **Course Outcome: CO6 Teaching Hours : 07 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	**Overview of Software Engineering**	6	2	2	10
2	**Process Models**	2	4	2	08
3	**Agile Methodology**	2	4	4	10
4	**Software Requirement Engineering**	2	4	4	10
5	**Software Modelling and Design**	4	4	4	12
6	**Software Project Management**	2	4	4	10
	Total	**18**	**22**	**20**	**60**

References/ Books:

Sr. No	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Software Engineering A Practitioner's Approach	Roger Pressman	9780078022128
2	Fundamentals of Software Engineering	Rajib Mall	9788120348981
3	Software Engineering Concepts	Richard Fairly	9780074631218
4	Software Engineering principles and practices	Deepak Jain	9780195694840

E-References:

1. www.sei.cmu.edu 2.www.rspa.com /spi
3. www.nptel.ac.in 4 www.tutorialspoint.com/software_engineering

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	2	1	1	1
CO2	2	2	2	2	2	2	2	1	1	1
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	2	3	2	2	2	1	2	2	2
CO5	2	2	2	3	2	2	2	2	2	1
CO6	2	1	2	2	2	1	2	1	2	1

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	2	1	1	1
CO2	2	2	2	2	2	2	2	1	1	1
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	2	3	2	2	2	1	2	2	2
CO5	2	2	2	3	2	2	2	2	2	1
CO6	2	1	2	2	2	1	2	1	2	1

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Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19305**				Course Title: **User Interface Design**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH	TS1	TS2	PR	OR	TW	Total
1	**2**		**3**	**---**	**---**	**---**	**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:

This subject is the technology subject, Web Page Design and Visual Basic is essential for studying this subject. **UID** is based on dot net technology, which is a framework, which supports many languages. C# is a multi-paradigm programming language encompassing strong typing, imperative, declarative, functional, generic object oriented, and component oriented programming language. ADO.NET is a set of computer software components that programmers can use to access data and data services from the database ASP.NET is an open-source server-side web application framework designed for web development to produce dynamic web pages.

Course Outcomes: Student should be able to

CO1	Use GUI tools of . NET framework
CO2	Use basic and advance . NET controls.
CO3	Interface back-end and front-end.
CO4	Build applications integrated with .NET Framework.
CO5	Build applications using C#
CO6	Build ASP.NET based applications.

Course Content Details: `

Unit No	Topics / Sub-topics
1	**Introduction to C# and .Net framework.** 1.1 Review of .NET frameworks 1.2 Introduction to C# 1.3 Data Types Literals and Variables in C# 1.4 Operators in C# 1.5 Flow controls in C# **Course Outcome:CO5 Teaching Hours :03Hrs Marks: NA**

2	**Implementation of C#** 2.1 Classes and Objects 2.2 Arrays and Strings 2.3 Operator Overloading 2.4 Inheritance 2.5 Debugging and error handling in C# 2.6 C# - Events, Properties, and Methods 2.7 C# and the CLR 2.8 C# and Generics **Course Outcome:CO1,CO2 Teaching Hours :04Hrs Marks: NA**
3	**Introduction to ADO.Net and data manipulation** 3.1 Introduction to ADO.Net - What is database? - Writing XML file. - ADO.Net architecture. - Creating connection. - Dataset and Data reader. - Types of Data adapter and ADO controls. - Reading data into dataset and data adapter. Binding data to controls. - Data table and Data row. 3.2 Accessing and manipulating data - Selecting data. - Insertion, deletion, updation, sorting. - How to fill dataset with multiple tables. 3.3 Migrating from VB 6.0 to VB.Net - Updating the applications developed in VB to VB.Net **Course Outcome: CO3 ,CO4 Teaching Hours : 04Hrs Marks: NA**
4	**Introduction and implementation of ASP.Net** 4.1 Introduction to ASP.Net - Difference between ASP and ASP.Net - Introduction to IIS. - What is web application? Why it is used? 4.2 Implementation of ASP.Net - ASP.Net IDE. - Creation of web forms. - Using web form controls **Course Outcome:CO6 Teaching Hours : 04 Hrs Marks: NA**

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 C# and .Net framework.**	3	NA			
2	**Implementation of C#**	4				
3	**Introduction to ADO.Net and data manipulation**	4				
4	**Introduction and implementation of ASP.Net**	4				
	Total	15				

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

Sr. No.	Unit No	CO	Title of the Experiments	Hours
1	1	5	Observe and draw visual .net IDE layout and hands on practice to create, save and open the project	2
2	1	5	Write, test and debug at least 5 loop, array and operator based C# programs.	4
3	1	5	Design forms and write, test and debug programs to test its various properties , methods, events.	2
4	2	1	Write, test and debug program to test input box and message box	2
5	2	1	Write, test and debug applications to use textbox, label, button	2
6	2	2	Write, test and debug applications to use radio button, checkbox, numeric updown and group box controls	2
7	2	2	Write, test and debug application using checked list box, scroll bars, timer control.	2
8	2	2	Write, test and debug applications using menu	2
9	3	3	Create and test connection using ado.net to view SQL express server/Microsoft Access data in textbox etc controls	4
10	3	3	Create connection view controls like data-grid view controls	2
11	3	3	Write, test and debug small application to add, edit, search, delete record in database in bounded mode	4
12	3	4	Write, test and debug small application to add, edit, search, delete record in database.	4
13	3	4	Write, test and debug small application to demonstrate data reports.	4
14	4	6	Write, test and debug small web application using asp.net	4
15	all	1,2,3,4,5,6	Mini Project	2
	Total			**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	The Complete Reference C#	Herbert Schildt Mc. Graw Hill	9780070703681
2	ASP.Net 4.0 Step By step	George Shepherd Microsoft	0735627010
3	The Complete Reference ADO.Net	Herbert Schildt Mc. Graw Hill	978-0072228984

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2					2	3		1
CO2	1			1			2	3	1	2
CO3	1		1				2	3		
CO4	1	3	3	2		3		3	2	2
CO5	2	2	2	1		3	3		2	3
CO6		3	1		1			1		1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Mahendra U. Dabhade	Lecturer	Government polytechnic Thane
2	Mr. Vaibhav A. Wankhade	Database Administrator	FIS Global Pune
3	Ms. Namrata A. Wankhade	Lecturer	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

I/C, 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 Information Technology (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				
CO19405	Cloud Computing	3	2		5	5	60	20	20	25*		25	150
IT19307	Artificial Intelligence	3	2		5	5					50*	50	100
IT19501	Entrepreneurship and Start-ups		2		2	2					25*	25	50
IT19308	Network and Information Security	3	2		5	5	60	20	20		25*	25	150
CO19309	Mobile Application Development	2	4		6	6				50*		50	100
IT19402 Optional 2	Geographical Information System	3	2		5	5	60	20	20	25*		25	150
IT19403 Optional 2	Introduction to Big data & Hadoop												
IT19404 Optional 2	Software Testing and Quality Assurance												
IT19309	Project		4		4	4					50*	50	100
IT19310	R Programming (MOOC)		3#		3#	3#							
	Total	**14**	**21**		**35**	**35**	**180**	**60**	**60**	**100**	**150**	**250**	**800**

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 assessment, **#**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- 2hours, Creative Activity-2 hours

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

Coordinator
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19405**				Course Title: **Cloud Computing**						
Compulsory / Optional: **Optional for Computer Engineering** **Compulsory for Information Technology**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	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 test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale: Cloud computing facilitates the access of applications and data from any location worldwide and from any device with an internet connection.It offers businesses with scalable computing resources hence saving them on the cost of acquiring and maintaining them.This course covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service. For different layers of the cloud technologies, practical solutions such as Google, Amazon, Microsoft, SalesForce.com, etc. solutions as well as theoretical solutions are introduced.

Course Outcomes: Students should be able to

CO1	Describe the basic concepts of Cloud Computing.
CO2	Use concept of Virtualization in Cloud Computing.
CO3	Analyze various cloud storage systems.
CO4	Demonstrate cloud Monitoring and Management techniques.
CO5	Study and Use concept of Cloud Security.
CO6	Compare different available Cloud Platforms.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Cloud Computing** 1.1 From Client-Server and collaborative computing to Cloud computing,Defining cloud Computing, Essential characteristics of cloud computing. 1.2 Cloud Deployment Model: Public cloud, Private cloud, Community cloud, Hybrid cloud. 1.3 Cloud Service Models: IaaS, PaaS, SaaS. 1.4 Cloud Economics and Benefits 1.5 Architecture of Cloud computing 1.6 Cloud Computing Infrastructure **Course Outcome: CO1 Teaching Hours :06 Marks: 10 (R- 04 , U-04 , A-02)**
2	**Virtualization** 2.1 Introduction, Characteristics of virtualized environment 2.2 Virtualization Types

	2.3 Technology Example: Vmware, Microsoft Hyper-V, KVM , Xen 2.4 Advantages of Virtualization ,VM Migration,VM consolidation and VM Management 2.5 Disadvantages of virtualization **Course Outcome:CO2 Teaching Hours:07 Marks: 10 (R- 04 , U-04 , A-02)**
3	**Storage in Cloud** 3.1 Storage system architecture, 3.2 Virtualize Data Centre(VDC) :Architecture, VDC Environment, server,storage, networking 3.3 Block and file level storage virtualization, Virtual Provisioning, and automated storage tiering, 3.4 Virtual Storage Area Network(VSAN) and benefits,3.5 Cloud file systems: GFS and HDFS, Comparisons among GFS and HDFS. **Course Outcome: CO3 Teaching Hours :08 Marks: 10 (R- 04 , U-04 , A-02)**
4	**Cloud Monitoring and Management** 4.1 Cloud Service Provider and users 4.2 SLA(Service Level Agreement) management: Types of SLA, Life cycle of SLA. 4.3 Service catlog, management and functional interfaces of services 4.4 Cloud portal and its functions 4.5 Cloud Service life cycle phases: Service planning, service creation, service operation and service termination,4.6 Software defined approach and techniques for managing IT resources **Course Outcome:CO4 Teaching Hours :08 Marks: 10 (R- 04 , U-04 , A-02)**
5	**Security in Cloud Computing** 5.1 Cloud Security Fundamentals 5.2 Cloud Risk 5.3 Cloud Risk division :Polity and Organizational Risks ,Technical Risks and Legal risks 5.4 Technologies for Data security, Data security risk 5.5 Digital identity and access management 5.6 Content level security 5.7 Security-As-A-Cloud Service **Course Outcome:CO5 Teaching Hours : 08 Marks: 10 (R- 04 , U-04 , A-02)**
6	**Cloud Computing at Work** 6.1 Cloud trends in supporting Ubiquitous Computing 6.2 Cloud Platforms: Amazon EC2 and S3,Microdsoft Azure , Cloud stack, Inter cloud, Google App Engine, Open Source cloud Eucalyptus, Open stack, Open Nebulla etc. 6.3 Future of Cloud-Based smart Devices, Faster time to Market for Software 6.4 Applications, Home Based Cloud Computing, Energy Aware Cloud Computing 6.5 Migrating to the Cloud : which application do you need?, Sending your existing data to cloud, Cost Saving . **Course Outcome:CO6 Teaching Hours : 08 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	**Introduction to Cloud Computing**	4	4	2	10
2	**Virtualization**	4	4	2	10
3	**Storage in Cloud**	4	4	2	10
4	**Cloud Monitoring and Management**	4	4	2	10
5	**Security in Cloud Computing**	4	4	2	10
6	**Cloud Computing at Work**	2	4	4	10
	Total	24	**24**	**12**	**60**

List of experiments:Total 10-12 experiments(or turns) out of 15-16 experiments(or turns)

Sr. No.	Unit No	Cos	Title of the Experiments	Hours
1	1	CO1	Review of cloud computing and its architecture.	2
2	2	CO2	Creating Virtual Machines , installing Operating system and applications on Virtual Machine.	2
3	2	CO2	Deleting Virtual Machine and recreating it.	2
4	2	CO2	Create a VM image and create VM from captured image.	2
5	6	CO3	Create and document the process of creating a Microsoft Azure Account(or any other free)	2
6	6	CO3	Create a free Microsoft Azure(or any other free) account and explore its management console	2
7	3	CO4	Demonstrate and use Amazon EC2 or Google cloud for storage.	2
8	2	CO4	Installing web server (Apache Tomcat) on VM, hosting simple web application on it.	2
9	5	CO5	Case Study of Security as a Service	2
10	2	CO4	Implementation of Virtualization using VM Ware‘s Workstation or Oracle‘s Virtual Box and Guest O.S.	2
11	6	CO6	Case Study: PAAS(Facebook, Google App Engine)	2
12	6	CO6	Case Study: Amazon Web Services.	2
13	3	CO3	Study Current Technologies for Large Data Processing(Google-GFS, BigTable and MapReduce)	2
14	6	C06	Installation and Configuration of CloudSim.	2
15	6	CO6	Building Application on Cloud	2
			Total	**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Cloud Computing, Principals and Paradigms	Rajkumar Buyya, J.Broberg, A. Goscinski A John Wilwy & Sons, Inc.,	ISBN: 978-0-470-88799-8
2	Cloud Computing	Rishabh Sharma Wiley Publication	ISBN: 978-81-265-5306-8
3	Handbook of Cloud Computing	Springer Publication	ISBN: 978-1-4419-6524-0
4	Mastering Cloud Computing	Rajkumar Buyya. Christian Vecchiola, Tata McGraw Hill Publication	ISBN: 978-1-25-902995-0

E-References:

1. https://ndl.iitkgp.ac.in/
2. www. tutorialpoint.com
3. www.cloud.google.com
4. www.udemy.com

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	3	3	2	3	3
CO2	2	2	3	3	1	3	2	2	3	2
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	3	2	3	3
CO5	1	2	3	3	2	3	3	2	3	3
CO6	2	2	3	3	2	3	3	2	3	3

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	3	3	2	3	3
CO2	2	2	3	3	1	3	2	2	3	2
CO3	2	3	3	2	2	2	2	2	2	2
CO4	2	3	2	3	2	3	3	2	3	3
CO5	1	2	3	3	2	3	3	2	3	3
CO6	2	2	3	3	2	3	3	2	3	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Ms.Pratibha Zunjare	Software Engineer	Proquest , USA.
2	Ms.Arade Madhuri	Lecturer , Information Technology	Govt. Polytechnic Kolhapur
3	Mrs.Vachani Neha H.	Lecturer , Computer Engg	Govt. Polytechnic Mumbai
4	Mrs.Lokhande Vandana S.	Lecturer , Computer Engg	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19307**				Course Title: **Artificial Intelligence**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2Hrs 30min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	**2**	**--**	**5**	**--**	**--**	**--**	**--**	**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 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:

Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. The overall research goal of **artificial intelligence** is to create technology that allows computers and machines to function in an **intelligent** manner. This course covers fundamentals of AI.

Course Outcomes: Student should be able to

CO1	Demonstrate knowledge of building blocks of AI as presented in terms of intelligent agents.
CO2	Analyze the problem as a state space, graph, design heuristics and select different search techniques to solve them.
CO3	Develop intelligent algorithms and intelligent systems.
CO4	Attain the capability to represent various real life problem domains using logic based techniques.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction:** 1.1 Artificial intelligence definition 1.2 Goals of AI 1.3 History of AI 1.4 Applications of AI **Course Outcome: CO1 Teaching Hours :3 hrs Marks: NA (R-, U-, A-)**
2	**Agents and Environments:** 2.1 Agent terminology 2.2 Structure of intelligent agents 2.3 Types of agents- simple reflex agents, Model based reflex agents, Goal based agents 2.4 Nature of environments, properties of environments 2.5 PEAS representation for an agent.

	Course Outcome: CO1 Teaching Hours :10 hrs Marks: NA (R- , U-, A-)
3	**Search Techniques** 3.1 Heuristic search: Best first search, Hill Climbing 3.2 Beam search, Tabu search 3.3 Finding Optimal Paths: Branch and Bound, Divide and Conquer approaches 3.4 Problem Decomposition: Goal Trees, 3.5 Game playing: Min-max algorithm, AlphaBeta Algorithm, Tic-tac-toe 3.6 Problem solving: Iterative Deepening depth first search (IDDFS) **Course Outcome: CO2, CO3 Teaching Hours :14 hrs Marks: NA (R- U- A-)**
4	**Planning and Logic:** 4.1. Planning 4.1.1. Introduction to planning 4.1.2. Planning with state space search 4.1.3. Planning and constraint satisfaction: Domains, forward and backward search, goal stack planning, plan space planning, Graphplan, Constraint stack planning, plan space planning, Graphplan, Constraint propagation. 4.2. Logic: 4.2.1. Propositional and First order logic 4.2.2. Forward and backward chaining 4.2.3. Conditional probability, Joint probability, Bayes Theorem, Belief networks and simple inference in Belief Networks **Course Outcome: CO3 Teaching Hours :10 hrs Marks: NA (R-, U-, A-)**
5	**Applications** 5.1 Introduction to Machine learning 5.2 Introduction to deep learning 5.3 Use of machine learning in deep learning 5.4 Introduction to NLP 5.5 Real life application of ML and NLP **Course Outcome: CO4 Teaching Hours :08 hrs Marks: NA (R- , U-, A-)**

List of experiments: Total 10 experiments out of 12 experiments should be performed.

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1, 2	CO1 CO2	Tutorial exercise for a) Design of intelligent system using PEAS b) Problem definition with state space representation	04

2	4	CO2	Implementation of Beam search algorithm	02
3	4	CO2	Implementation of Tabu search algorithm	02
4	4	CO2	Implementation of depth search algorithm	02
5	4	CO2	Implementation of Min-Max algorithm	02
6	4	CO2	Implementation of Divide and Conquer algorithm	02
7	4	CO3	Implementation of Tic-tac-toe algorithm	02
8	4	CO3	Implementation of AlphaBeta algorithm	04
9	4	CO3	Implementation of Bayes' Belief Netwok	04
10	6	All COs	Case study on AI based humanoid self-driving car	02
11	6	All COs	Case study on AI in finance sector	02
12	6	All COs	Case study on AI in medical applications.	02
Total				30

Note: Experiments 1,2,7,10 and 11 are compulsory.

References/ Books:

Sr. No.	Book Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Artificial Intelligence: A modern Approach	Stuart Russell and Peter Norvig; Pearson education; 3rd edition; 2015	9789332543515
2	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivshankar B Nair; McGraw Hill; 3rd edition, 2017	9780070087705
3	A first course in Artificial Intelligence	Deepak Khemani; McGraw Hill; 1st edition, 2017	9781259029981
4	A classical approach Artificial Intelligence	M. C. Trivedi; Khanna Publishing House; 2nd edition; 2018	9788190698894

E-References:

1. nptel.ac.in/courses/106106126
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://www.tutorialride.com/artificial-intelligence/artificial-intelligence-tutorial.htm
4. https://www.c-sharpcorner.com/article/a-complete-artificial-intelligence-tutorial/

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rahul Kashyap	Analyst National Advisory	Ernst & Young
2	Dr. Uday Khot	Associate Professor	St. Fransis College Borivali
3	Dr. R. A. Patil (Curriculum Content Designer)	Sel. Grade Lecturer in Electronics	Govt. Polytechnic Mumbai

Coordinator, Head of Department
Curriculum Development, Department of Information Technology
Department of Information Technology

I/C, Curriculum Development Cell Principal

Programme : Diploma in Information Technology and Computer Engineering (Sandwich Pattern)										
Course Code: **IT19501**				Course Title: **Entrepreneurship and Start-ups**						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH	TS1	TS2	PR	OR	TW	Total
--	**2**	--	**2**	--	--	--	--	**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 tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale: Entrepreneurs are often thought of as national assets to be refined, motivated and remunerated to the greatest possible extent. Entrepreneurs can change the way we live and work. If successful, their revolutions may improve our standard of living. In short, in addition to creating wealth from their entrepreneurial ventures, they also create jobs and the conditions for a flourishing society. This course will try to inculcate the values of Entrepreneurship and Start up among the students.

Course Outcomes: Student should be able to

CO1	Understand the dynamic role of entrepreneurship and small businesses.
CO2	Create business ideas / opportunities
CO3	Explain Financial Planning and Control
CO4	Illustrate Break Even Analysis
CO5	Choose Marketing Strategy
CO6	Explain New Product or Service development

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Management** 1.1 Introduction to Management, organisation structure 1.2 Difference between Management & Administration 1.3 Concept of Scientific Management 1.4 Functions of management 1.5 Introduction to Human Resource Management 1.6 Staffing, training & induction to staff.
2	**Financial & Project Management** 2.1 Importance of financial management 2.2 Financial organization and management 2.3 Budgets & their analysis 2.4 Project management 2.5 CPM ,PERT analysis & application 2.6 Break even analysis, KAIZEN ,6S.
3	**Introduction to Entrepreneurship** 3.1 Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation 3.2 Types of Business Structures, differences between entrepreneur & manager 3.3 Business Ideas and their implementation 3.4 Discovering ideas and visualizing the business 3.5 Activity map 3.6 Business Plan 3.7 Double Diamond Approach
4	**Start ups** 4.1 Introduction, Idea to Start-up 4.2 Market Analysis – Identifying the target market, 4.3 Competition evaluation and Strategy Development, 4.4 Marketing and accounting, 4.5 Risk analysis
5	**Planning for Startup** 5.1 Financing and Protection of Ideas 5.2 Financing methods available for start-ups in India 5.3 Communication of Ideas to potential investors – Investor Pitch 5.4 Patenting and Licenses
6	**Strategies for Entrepreneurs** 6.1 Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy

Tutorial/Assignment:

Note: All assignments are compulsory

Sr. No.	Unit No	COs	Title of tutorial/assignment	Hours
1	1	CO1	Interactive session with an Entrepreneur	02
2	2	CO2	Brain storming of ideas for start-up in current scenario	04
3	3	CO2	Identification of business opportunity	04
4	4	CO3	Financing the start up	04
5	4	CO3	Running the startup	04
6	4	CO4	Break even analysis	04
7	4	CO5	Marketing strategy	04
8	4	CO6	Preparing project report	06
Total				**32**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf, K & S Ranch Publication	978-0984999392
2	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries, Penguin UK	978-0670921607
3	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber, Headline Book Publishing	978-0755388974
4	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen, Harvard business	978-142219602

E-References:

1. https://www.fundable.com/learn/resources/guides/startup

2 .https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/

3. https://www.finder.com/small-business-finance-tips

4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

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
CO2	--	--	3	3	3	3	2	--	--	3
CO3	--	--	3	3	3	3	2	--	--	3
CO4	--	--	3	3	3	3	2	--	--	3
CO5	--	--	3	3	3	3	2	--	--	3
CO6	--	--	3	3	3	3	2	--	--	3

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr.Pranav Raman	Director	Soft tech solutions Mumbai
2	Mr.Santosh Bhosale	Software Engineer	TCS, Mumbai
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4	Ms. N. A. Wankhade	Lecturer in IT	Government Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19308**				Course Title: **Network and Information Security**						
Compulsory / Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 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 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:

Computer network security is an important aspect in today's world. Now days due to various threats designing security in organization is an important consideration. It is essential to understand basic security principles, various threats to security and techniques to address these threats. The student will be able to recognize potential threats to confidentiality, integrity and availability and also able to implement various computer security policies. This course will introduce basic cryptographic techniques, fundamentals of computer/network security, Risks faced by computers and networks, security mechanisms, operating system security, secure System design principles, and network security principles. Also it will create awareness about IT ACT and different Cyber laws.

Course Outcomes:

Student should be able to:

CO1	Identify risks related to Computer security and Information hazard in various situations.
CO2	Apply user identification and authentication methods.
CO3	Apply cryptographic algorithms and protocols to maintain Computer Security.
CO4	Apply measures to prevent attacks on network using firewall.
CO5	Maintain secured networks and describe Information Security Compliance standards.

Course Content Details: `

Unit No	Topics / Sub-topics
1	**Introduction to Computer and Information Security** 1.1 Foundations of Computer Security: Definition and Need of computer security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Non-Repudiation and Reliability. 1.2 Risk and Threat Analysis: Assets, Vulnerability, Threats, Risks, Counter measures. 1.3 Threat to Security: Viruses, Phases of Viruses, Types of Virus, Dealing with Viruses, Worms, Trojan Horse, Intruders, Insiders. 1.4 Type of Attacks: Active and Passive attacks, Denial of Service, DDOS, Backdoors and Trapdoors, Sniffing, Spoofing, Man in the Middle, Replay, TCP/IP Hacking, Encryption attacks. 1.5 Operating system security: Operating system updates: HotFix, Patch, Service Pack. 1.6 Information, Need and Importance of Information, information classification, criteria for information classification, Security, need of security, Basics principles of information security **Course Outcome:CO1 Teaching Hours :12 Marks: 12 (R- 06, U- 04 , A- 02)**
2	**User Authentication and Access Control** 2.1 Identification and Authentication: User name and Password, Guessing password, Password attacks-Piggybacking, Shoulder surfing, Dumpster diving. 2.2 Biometrics: Finger Prints, Hand prints, Retina, patterns, Voice patterns, Signature and Writing patterns, Keystrokes. 2.3 Access controls: Definition, Authentication Mechanism, Principle-Authentication, Authorization, Audit, Policies: DAC, MAC,RBAC. **Course Outcome:CO2 Teaching Hours :06 Marks: 10 (R- 04, U- 04 , A- 02)**
3	**Cryptography** 3.1 Introduction: Plain Text, Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. 3.2 Substitution Techniques: Caesar's cipher, Modified Caesar's Cipher, Transposition Techniques: Simple Columnar Transposition. 3.3 Steganography: Procedure 3.4 Symmetric and Asymmetric cryptography: Introduction to Symmetric encryption, DES (Data encryption Standard) algorithm, Asymmetric key cryptography: Digital Signature. **Course Outcome: CO3 Teaching Hours: 06 Marks: 10 (R- 02 , U- 04 , A- 04)**
4	**Firewall and Intrusion Detection System** 4.1 Firewall: Need of Firewall, types of firewall- Packet Filters, Statefull Packet Filters, Application Gateways, Circuit gateways. 4.2 Firewall Policies, Configuration, limitations, DMZ. Intrusion Detection System 4.3 Vulnerability Assessment, Misuse detection, Anomaly Detection, Network Based IDS, Host-Based IDS, Honeypots **Course Outcome:CO4 Teaching Hours: 11 Marks:14 (R- 04 , U- 06, A- 04)**

5	**NetworkSecurity, Cyber Laws andCompliance Standards.** 5.1 Kerberos: Working, AS, TGS, SS 5.2 IP Security- Overview, Protocols- AH, ESP, Modes- transport and Tunnel. 5.3 Email security- SMTP, PEM, PGP. 5.4 Public key infrastructure (PRI): Introduction, Certificates, Certificate authority, Registration Authority, X.509/PKIX certificate format. 5.5 Cyber Crime: Introduction, Hacking Digital Forgery, Cyber Stalking/Harassment, Cyber 5.6 Identity Theft and terrorism, Cyber Delhi Jon. Cyber Laws **Course Outcome: CO5 Teaching Hours : 10 Marks: 14 (R- 06 , U- 06 , A- 02)**

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 Computer and Information Security	12	06	04	02	12
2	User Authentication and Access Control	06	04	04	02	10
3	Cryptography	06	02	04	04	10
4	Firewall and Intrusion Detection System	11	04	06	04	14
5	Network Security, Cyber Laws and Compliance Standards.	10	06	06	02	14
	Total	45	22	24	14	60

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

Sr. No.	Unit No	Title of the Experiments	Hours	CO
1	1	a. Install and configure Antivirus software on system (any). b. Set up operating system Updates.	2	CO1
2	1	Perform backup and restore of System	2	CO1
3	2.	Set up Passwords to operating systems and applications.	2	CO2
4	2.	Apply security to the file folder or application using access permissions and verify.	2	CO2
6	3.	Write a program to implement Caeser Cipher	2	CO3
7	3.	Write a program to implement Vernam Cipher	2	CO3
8	3.	Create and verify Hash Code for given message	2	CO3
9	3.	Create and verify digital signature using tool (e.g. Cryptool)	2	CO3
10	3.	Use Steganography to encode and decode the message using any tool.	2	CO3
11	4	a.Install firewall on any operating system b. Configure firewall settings on any operating system.	2	CO4
12	5	Create and verify Digital Certificate using tool (e.g. Cryptool)	2	CO5
13	5	Trace the origin of Email using any tool(e.g. emailTrackerPro)	2	CO5
14	5	Trace the path of web site using Tracert Utility	2	CO5
15	5	PGP Email Security a. Generate Public and Private Key Pair. b. Encrypt and Decrypt message using key pair.	2	CO5
	Total		**30**	

References/ Books:

S. No.	Title of Book	Author, Publication	ISBN
1	Computer Security	Dieter Gollmann Wiley Publication, New Delhi	978-0-470-74115-3
2	Cryptography and Network Security	Atul Kahate McGraw Hill Education, New Delhi	978-1-25-902988-2
3	Cyber Laws and IT Protection	Harish Chander PHI Publication, New Delhi,	978-81-203-4570-6

4	Implementing Information Security based on ISO 27001 / ISO 27002 (Best Practice)	Alan Calder Van Haren Publishing	ISBN-13: 978-9087535414 ISBN-IO: 9087535414

CO VsPO and CO Vs PSO Mapping

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

Industry Consultation Committee:

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1	Mr. Mahendra U. Dabhade	Lecturer	Government polytechnic Thane
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Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Computer Engineering and Information Technology (Sandwich Pattern)**										
Course Code: **CO19309**				Course Title: **Mobile Application Development**						
Compulsory/ Optional: **Compulsory**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 Mins)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
02	**04**	**--**	**06**	**--**	**--**	**--**	**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 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:

Mobile Application Development has been a source of different opportunities and challenges for soft developers since last decade. Although there very few platforms are available for application development, Android OS being open source has become very popular and widely used platform among all. This course aims at making students able to develop professional quality Android Apps and generate revenue out of it.

Course Outcomes: Student should be able to

CO1	Understand Project Structure, Logical Components and Platform Architecture of Android.
CO2	Develop Android Apps using UI Components and Event Listeners.
CO3	Perform Remote Database Operations using Firebase.
CO4	Develop Android Apps using NavigationDrawer and RecyclerView.
CO5	Access hardware and sensors in Android Apps.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction** 1.1 Latest Trends in Mobile Application Development 1.2 Different Platforms in Mobile Application Development: Apple iOS, Windows Mobile OS and Android OS Architecture 1.3 Why Android? 1.4 Installing Android Studio 1.5 Android versions: features and limitations, number of devices currently running on each version and how to choose a specific version for a given App Development 1.6 Android SDK Manager 1.7 Android Project Structure

	1.8 Create "Hello-Android-World" application **Course Outcome: CO1 Teaching Hours : 2 hrs**
2	**Android Architecture** 2.1 Android Platform Architecture 2.2 Logical components of Android app 2.3 Android Tool Repository 2.4 Files: Manifest, Java, Res, Gradle 2.5 AVD Creation 2.6 Running Apps on an Android Phone 2.7 Publishing Apps on Google Play Store or on website **Course Outcome: CO1 Teaching Hours : 2 hrs**
3	**UI Components and Event Listeners** 3.1 Overview of XML Design 3.2 Activity life cycle 3.3 Layouts: RelativeLayout, LinearLayout 3.4 UI resources, String resources, Image resources 3.5 Views: Button, TextView, ImageView, EditText, Checkbox, Spinner, Date and Time Picker, ListView 3.6 Common attributes of View 3.7 Event handling associated with Views, AlertDialog, Navigation between Activities, ActionBar 3.8 Intents 3.8.1 Implicit Intents: Share, Dial Number 3.8.2 Explicit Intents: Splash, Activity to Activity 3.9 Menu: Popup, Context, Option 3.10 Fragments, Fragment Life cycle, Interaction between Fragments 3.11 Types of Animations on Views: Scale, Rotate, Translate, Alpha **Course Outcome: CO2 Teaching Hours : 6 hrs**
4	**Data Storage Management** 4.1 Internal and External File storage Operation 4.2 Shared Preference 4.3 How to use Shared Preferences 4.4 Maintain login session using Shared Preferences 4.5 SQLite database **4.6** Firebase and Remote Database Operations **4.7** Notifications using Firebase **Course Outcome: CO3 Teaching Hours : 4 hrs**
5	**NavigationDrawer and RecyclerView** 5.1 What is NaigationDrawer? 5.2 Adding /menu to NavigationDrawer 5.3 Customizing NvigationDrawer 5.4 RecyclerView 5.5 Creating ListView and GridView using RecyclerView

	5.6 LayoutManager in RecyclerView **Course Outcome: CO4 Teaching Hours : 4 hrs**
6	**Accessing Hardware/ Sensors and Sensor Data** 6.1 Internet. Call, Messages 6.2 Multimedia: Audio, Video, Camera 6.3 Bluetooth, Wifi, GPS 6.4 Sensors 6.4.1 Motion Sensors: Gyroscope, Accelerometer, Gravity Sensor 6.4.2 Position Sensors: Orientation Sensors, Magnetometers, Proximity Sensor 6.4.3 Environmental Sensors: Ambient Air Temperature, Pressure, Illumination, Humidity 6.5 Sensor Framework and Best Practices for accessing Sensor and Sensor Data **Course Outcome: CO5 Teaching Hours : 12 hrs**

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1, 2	CO1	Download Install and Configure Android Studio on Windows/ Linux environment.	4
2	2, 3	CO2	Building Simple User Interface using UI Widgets, Layouts and Adapters. Use Material Design Pattern.	4
3	3	CO2	Develop an application having animation on views.	4
4	4	CO3	Develop an Android App in which a user can register. After registration user can login with the credentials supplied for registration using Firebase.	6
5	5	CO4	Develop an Android App to your college display a NavigationDrawer with Menus like About Us, Departments, Student Section, Contact Us, etc.	4
6	5	CO4	Design an android based application to display contact list in RecyclerView	6
7	6	CO5	Develop an application to make and receive calls on mobile.	4
8	6	CO5	Design an android based application to take a snapshot by using the Camera in your mobile.	4
9	6	CO5	Develop an application to access Bluetooth and Wi-Fi.	4
10	6	CO5	Design an android based application to demonstrate GPS services using Google Maps.	4
11	6	CO5	Develop an application to access Accelerometer, Gyroscope, Orientation Sensors and to display data received from each sensor.	6
12	2	CO1`	Publish all the above apps on your own website. (To be performed side by side along with all the experiments above)	2
13	All	All	Mini Project	8

			(To be performed side by side along with all the experiments above)	
			Total	60

E-References:

1. https://developer.android.com/docs
2. https://developer.android.com/guide/topics/manifest/uses-sdk-element#ApiLevels
3. https://developer.android.com/guide/topics/sensors/sensors_overview

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

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
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Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19402**				Course Title: **Geographical Information System(GIS)**						
Compulsory / Optional: **Optional**										
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	**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 AR 26. 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:

GIS (Geographic Information Systems) is a computer-based tool that uses spatial (geographic) data to analyze and solve real-world problems. This course is designed to introduce the student to the basic principles and techniques of GIS. Introduction to GIS is designed to provide the students with an understanding of the methods and theories of spatial analysis that will allow students to apply GIS knowledge and skills to everyday life and their chosen careers.

Course Outcomes:

Student should be able to:

CO1	Define GIS and Spatial data
CO2	Compare Spatial Referencing and Positioning
CO3	Identify vector and raster data structures and the appropriate use of each of these data structures
CO4	Learn the basics of data capture, storage, analysis, and output in a GIS
CO5	Explain data visualization
CO6	Organize and process different data

Course Content Details: `

Unit No	Topics / Sub-topics
1	**Introduction to GIS** **1.1 The nature of GIS:** Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. **1.2 The real world and representations of it:** Models and modelling, Maps, Databases, Spatial databases and spatial analysis **1.3 Models and Representations of the real world:** **1.3.1 Geographic Phenomena:** Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries **1.3.2 Computer Representations of Geographic Information:** Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects **1.4 Organizing and Managing Spatial Data** **1.5 The Temporal Dimension** **Course Outcome:CO1 Teaching Hours :06 Marks: 08 (R- 02 , U- 02 , A- 04)**
2	**Data Management and Processing System** **2.1 Hardware and Software Trends** **2.2 Geographic Information Systems:** GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) **2.3 Stages of Spatial Data handling:** Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. **2.4 Database management Systems:** Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. **2.5 GIS and Spatial Databases:** Linking GIS and DBMS, Spatial database functionality. **Course Outcome:CO4, C03 Teaching Hours :05 Marks: 10 (R- 04 , U- 02 , A- 04)**
3	**Spatial Referencing and Positioning** **3.1 Spatial Referencing:** Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations **3.2 Satellite-based Positioning:** Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology **Course Outcome: CO2 Teaching Hours : 07 Marks: 10(R- 02 , U- 02 , A- 06)**
4	**Data Entry and Preparation** **4.1 Spatial Data Input:** Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere **4.2 Data Quality:** Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency **4.3 Data Preparation:** Data checks and repairs, Combining data from multiple sources **4.4 PointData Transformation:** Interpolating discrete data, Interpolating continuous data **Course Outcome:CO4 Teaching Hours : 07 Marks: 10 (R- 02 , U- 04 , A- 04)**

5	**Spatial Data Analysis** **5.1 Classification of analytical GIS Capabilities** **5.2 Retrieval, classification and measurement**: Measurement, Spatial selection queries, Classification **5.3 Overlay functions:** Vector overlay operators, Raster overlay operators **5.4 Neighborhood functions:** Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis **5.5 Analysis:** Network analysis, interpolation, terrain modelling **5.6 GIS and Application models**: GPS, Open GIS Standards, GIS Applications and Advances **5.7 Error Propagation in spatial data processing:** How Errors propagate, Quantifying error propagation **Course Outcome: CO4, CO6 Teaching Hours : 10 Marks: 12 (R- 04 , U- 02 , A- 06)**
6	**Data Visualization** **6.1 GIS and Maps, The Visualization Process** **6.2 Visualization Strategies:** Present or explore? **6.3 The cartographic toolbox:** What kind of data do I have? How can I map my data? **6.4 How to map?** How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series? **6.5 Map Cosmetics, Map Dissemination** **Course Outcome: CO5 Teaching Hours: 10 Marks: 10 (R- 04 , U- 04 , A- 02)**

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Introduction to GIS**	2	2	4	8
2	**Data Management and Processing System**	4	2	4	10
3	**Spatial Referencing and Positioning**	2	2	6	10
4	**Data Entry and Preparation**	2	4	4	10
5	**Spatial Data Analysis**	4	2	6	12
6	**Data Visualization**	4	4	2	10
	Total	**18**	**16**	**26**	**60**

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

Sr. No.	CO	Unit No	Title of the Experiments	Hours
1	CO1	1	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.	2
2	CO3	2	Creating and Managing Vector Data: Adding vector layers, setting properties	2
3	CO3	2	Creating and Managing Vector Data: formatting, calculating line lengths and statistics	2
4	C03	2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis.	2
5	CO3	2	Exploring and Managing Raster data: raster mosaicking and clipping	2
6	CO2	3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data	2
7	CO2	3	Working with attributes, terrain Data	2
8	CO2	3	Working with Projections and WMS Data	2
9	C04	4	GeoreferencingTopo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data	2
10	C04	4	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries	2
11	C06	5,6	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data	2
12	C06	5,6	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas	2
13	C05	6	Validating Map data	2
14	C04	4	Demonstrate the Use of GIS in mobile application	2
15	ALL COs	1,2,3,4,5,6	Mini project	4
		Total		**32**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Principles of Geographic Information Systems- An Introductory Text Book	Geographic Information Systems- An Introductory Text Book Editors: Otto Huisman and Rolf A.	90-6164-226-4
2	Principles of Geographic Information System	P.A Burrough and R.A.McDonnell, Oxford University Press	9780198742845
3	Fundamentals of Spatial Information Systems,	R.Laurini and D. Thompson, Academic Press	9780124383807
4	Fundamentals of Geographic Information Systems	Michael N.Demers Wiley Publications	9780470129067

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

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I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19403**				Course Title: **Introduction to Big Data and Hadoop**						
Compulsory / Optional: **Optional**										
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	**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 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:

Big data analytics examines large amounts of data to uncover hidden patterns, correlations and other insights. With today's technology, it's possible to analyze your data and get answers from it almost immediately – an effort that's slower and less efficient with more traditional business intelligence solutions. Big data analytics helps organizations harness their data and use it to identify new opportunities.

Course Outcomes:

Student should be able to:

CO1	Define Big data and Hadoop ecosystem
CO2	List the key issues in big data management and its associated applications
CO3	Analyze various forms of Big Data
CO4	Adapt adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.
CO5	Solve Complex real world problems in various applications like recommender systems, social media applications, health and medical systems, etc.

Course Content Details: `

Unit No	Topics / Sub-topics
1	**Introduction to Big Data** 1.1 Introduction to Big Data, Data Mining, Data Warehousing 1.2 Big Data characteristics, types of Big Data, 1.3 Traditional vs. Big Data business approach, 1.4 Case Study of Big Data Solutions. **Course Outcome:CO1 Teaching Hours :08 Marks: 12 (R- 02 , U- 04 , A- 06)**

2	**Introduction to Hadoop** 2.1 Concept of Hadoop 2.2 Core Hadoop Components 2.3 Hadoop Ecosystem 2.4 Hadoop HDFS 2.5 Hadoop Limitations **Course Outcome:CO4 Teaching Hours :08 Marks: 10 (R- 02 , U- 04 , A- 04)**
3	**MapReduce** 3.1 Distributed File Systems: Physical Organization of Compute Nodes, Large-Scale File-System Organization. 3.2 MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping with Node Failures. 3.3 Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce **Course Outcome: CO2, CO3 Teaching Hours : 09 Marks: 12(R- 02 , U- 04 , A- 06)**
4	**Finding Similar Items and Clustering** 5.1 Distance Measures: Definition of a Distance Measure, Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance. 5.2 CURE Algorithm, Stream-Computing, A Stream-Clustering Algorithm, Initializing & Merging Buckets, Answering Queries **Course Outcome: CO5 Teaching Hours: 10 Marks: 14 (R- 02 , U- 04 , A- 08)**
5	**Real-Time Big Data Models** 6.1 PageRank Overview, Efficient computation of PageRank: PageRank Iteration Using MapReduce, Use of Combiners to Consolidate the Result Vector. 6.2 A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering. 6.3 Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities in a social graph. **Course Outcome: CO5 Teaching Hours: 10 Marks: 12 (R- 04, U- 04 , A- 04)**

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 Big Data**	8	2	4	6	12
2	**Introduction to Hadoop**	8	2	4	4	10
3	**MapReduce**	9	2	4	6	12
4	**Finding Similar Items and Clustering**	10	2	4	8	14
5	**Real-Time Big Data Models**	10	4	4	4	12
	Total	**45**	**12**	**20**	**28**	**60**

List of experiments: Total 10 experiments (or turns) out of 12experiments(or turns)

Sr. No.	Unit No	CO	Title of the Experiments	Hours
1	1,2	CO1	Hadoop HDFS Practical: -HDFS Basics, Hadoop Ecosystem Tools Overview. -Installing Hadoop.	2
2	1,2	CO1	Hadoop HDFS Practical: Copying File to Hadoop. -Copy from Hadoop File system and deleting file. -Moving and displaying files in HDFS.	2
3	1,2	CO4	Use of Sqoop tool to transfer data between Hadoop and relational database servers. a. Sqoop - Installation. b. To execute basic commands of Hadoop eco system component Sqoop	2
4	3	CO2	-Implementing simple algorithms in Map-Reduce: Matrix multiplication, Aggregates, Joins, Sorting, Searching, etc	2
5	3	CO2	Create HIVE Database and Descriptive analytics-basic statistics, visualization using Hive/PIG/R	4
6	3	CO3	Write a program to implement word count program using MapReduce	2
7	3	CO3	Implementing DGIM algorithm using any Programming Language	2
8	3	CO3	Implement Bloom Filter using any programming language.	2
9	4	CO2, 3	Implementing any one Clustering algorithm (K-Means/CURE) using Map-Reduce.	4
10	5,6	CO4	Implement PageRank using Map-Reduce	2
11	5,6	CO5	Implement predictive Analytics techniques (regression / time series, etc.) using R/ Scilab/ Tableau/ Rapid miner	2
12	1,2,3, 4,5,6	ALL COs	Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web).	4
Total				**30**

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mining of Massive Datasets‖	Cre Anand Rajaraman and Jeff Ullman Cambridge University Press,	9781107015357
2	Hadoop in Practice	Alex Holmes Manning Press, Dreamtech Press.	9781617290237

1. Bill Franks , ―Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics‖, Wiley 2. Chuck Lam, ―Hadoop in Action‖, Dreamtech Press 3. Jared Dean, ―Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners‖, Wiley India Private Limited, 2014

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Mahendra U. Dabhade	Lecturer	Government polytechnic Thane
2	Mr. Vaibhav A. Wankhade	Database Administrator	FIS Global Pune
3	Ms. Namrata A. Wankhade	Lecturer	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

I/C, Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code:**IT19404**				Course Title: **Software Testing and Quality Assurance**						
Compulsory / Optional: **Optional**										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30min)	TS1 (1Hr)	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:

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect free in order to produce the quality product.

student will learn how to immediately find problems in any computer program, how to plan an effective test approach, how to clearly report your finding and how to tell when your software is ready for release.

Course Outcomes: Student should be able to

CO1	Understand software testing concept and importance of Quality software
CO2	Use the different software testing approach.
CO3	Understand STLC, test planning, test case writing and test case execution.
CO4	Identify and fix various defects/bugs.
CO5	Use the various automated testing tools to improve testing efficiency and overcome limitation of Manual testing.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Basics of Software Testing** 1.1 Definition of Software Testing, what is Quality?, Software Quality, Role of Testing 1.2 Failure, Error, Fault, Defect, Bug Terminology 1.3 Objectives of Testing 1.4 Test Case 1.5 When to Start and Stop Testing of Software (Entry and Exit Criteria) 1.6 Skills for Software Tester ,SDLC 1.7 Quality Assurance, Quality Control, Verification and Validation, **Course Outcome: CO1 Teaching Hours :4hrs Marks: 6 (R- 0, U-2, A-4)**

2	**Types of Testing** 2.1 White Box Testing : Classification of White Box Testing 1. Static Testing- Inspections, Structured Walkthroughs, Technical Review 2. Structural Testing-Code Functional Testing, Code Coverage Testing, Code Complexity Testing 2.2 Black Box Testing: 2.2.1 Requirement Based Testing, 2.2.2 Positive and Negative Testing, 2.2.3 Boundary Value Analysis, 2.2.4 Decision Tables, 2.2.5 Equivalence Partitioning, 2.2.6 User Documentation Testing, 2.3 Sample Examples on White and Black Box Testing **Course Outcome: CO2 Teaching Hours :10 hrs Marks: 14 (R- 2, U-4, A-8)**
3	**Levels of Testing and Special Tests** 3.1 **Unit Testing**: Driver, Stub 3.2 **Integration Testing**: Decomposition Based Testing - Top-Down Integration, Bottom-Up Integration, Bi-Directional Integration, Incremental Integration, Non-Incremental Integration 3.3 **System Testing**: Recovery Testing, Security Testing, Performance Testing, Load Testing, Stress Testing, Usability Testing, Compatibility Testing 3.4 **Acceptance Testing**: Acceptance criteria, Alpha Testing an Beta Testing 3.5 **Special Tests**: Smoke Testing and Sanity Testing, Regression Testing, Usability Testing, GUI Testing, Object Oriented Application Testing: Client-Server Testing, Web based Testing **Course Outcome: CO2 Teaching Hours :10hrs Marks: 14 (R- 2, U-4, A-8)**
4	**Test Management** 4.1 **Test Planning** :STLC(software testing life cycle) Preparing a Test Plan, Scope Management, Deciding Test Approach, Setting Up Criteria for Testing, Identifying Responsibilities, Staffing, Training Needs, Resource Requirements, Test Deliverables, Testing Tasks 4.2 **Test Management**: Choice of Standards, Test Infrastructure Management, Test People Management, Integrating with Product Release 4.3 **Test Process**: Base Lining a Test Plan, Test Case Specification, Update of Traceability 4.4 **Test Reporting**: Recommending Product Release. Matrix, Executing Test Cases, Collecting and Analyzing Metrics, Preparing Test Summary Report. **Course Outcome: CO3 Teaching Hours :8hrs Marks: 10 (R- 2, U-2, A-6)**
5	**Defect Management** 5.1 Introduction, Defect Classification, Defect Management Process 5.2 Defect Life Cycle, Defect Template

	5.3 Estimate Expected Impact of a Defect, Techniques for Finding Defects, Reporting a Defect **Course Outcome: CO4 Teaching Hours :6hrs Marks: 8 (R- 2, U-2, A-4)**
6	**Testing Tools and Measurements** 6.1 Limitations of Manual Testing and Need for Automated Testing tools, What is Automation Testing?, Manual Testing vs Automation Testing, Automation testing Tools 6.2 Features of Test Tool: Guideline for Static and Dynamic Testing Tool 6.3 Advantages and Disadvantages of Using Tools 6.4 Selecting a Testing Tool 6.5 When to Use Automated Test Tools, Testing Using Automated Tools 6.6 What are Metrics and Measurement**:** Types of Metrics, Project Metrics, Progress and Productivity Metrics **Course Outcome: CO5 Teaching Hours :7hrs Marks: 8 (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	**Basics of Software Testing**		02	04	06
2	**Types of Testing**	02	04	08	14
3	**Levels of Testing and Special Tests**	02	04	08	14
4	**Test Management**	02	02	06	10
5	**Defect Management**	02	02	04	08
6	**Testing Tools and Measurements**	02	02	04	08
	Total	**10**	**16**	**34**	**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	2	Study system specification & designing test cases for Inventory & purchase order management. (Min 20 Test case)	02
2	3	2	Design and write test cases for simple calculator application.	02
3	3	2	Design and write test cases for ATM. (Min 20 Test case).	02
4	4	3	Design test write test cases for Notepad (MS Window based) Application.	02
5	4	3	Design test cases for Social site (Twitter, Face book) login form. (Write test cases in test case format) and prepare a bug report document.	02

6	4	3	Design test cases for Amazon 1.Amazon Search Functionality Test Cases 2. Amazon Login Screen Test Cases 3. Amazon Search Box Button Test Case	02
7	5	4	Write the test cases for any known application and prepare bug report document. (eg. Banking Application)	02
8	6	5	Study of Automated Testing Tools.(Bugzilla, Selenium, Mentis, QTP, or any freeware tool)	02
9	6	5	Using an Automated/ computerized tool, Atomizing and running test cases for MS-Paint application (MS Windows based).	02
10	4	3	Design the test cases for setting up of company Infrastructure.	02
11	4	3	Implement test cases for MS Word application using an Automation Tool	02
12	3	2	Create a test plan document for Library Management System	02
13	4	3	Design test cases for college Admission form. (Write test cases in test case format)	02
14	6	5	Design test cases for flip-kart purchase management system using automatic tool.	02
15	1-6	1-5	Mini project -Test Your Final Year Project using all types of testings and prepare report.	02

Note: Experiments No. 1 to 5 are compulsory. Remaining 5 experiments should be performed as per the importance of the topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Software Testing: Principles and Practices	Srinivasan Desikan Gopalaswamy Ramesh	9788177581218
2	Software Testing: Principles, Techniques and Tools	M. G. Limaye Tata McGraw-Hill	9780070139909
3	Software quality Assurance, testing and metrics	Anirban Basu Phi Learning	978-81-203-5068-7

E-References:

1. https://www.tutorialspoint.com/software_testing
2. https://www.javatpoint.com/quality-assurance
3. https://www.altexsoft.com

CO Vs PO and CO Vs PSO Mapping

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

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr.Ulka Katekar	Software Engineer	TCS
2	Mr.Rohan Gopale	HOD,Conputer Engineering Dept.	Kala Vidya Polytechnic ,Malad
4	Ms.Dipali Gosavi	Lecturer in Information Technology	Govt. Polytechnic Mumbai

Coordinator, Head of Department
Curriculum Development, Department of Information Technology
Department of Information Technology

I/C, Curriculum Development Cell Principal

Programme: **Diploma in Information Technology (Sandwich Pattern)**									
Course Code:**IT19309**				Course Title: **Project & seminar**					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
L	P	TU	Total	TH	TS	PR	OR	TW	Total
-	**4**	**-**	**4**	**-**	**-**		**50***	**50**	**100**

Rationale:
The aim of the project is to provide an opportunity to the students to work on an open ended engineering problem. The students will be able to apply knowledge from different areas or courses, which they have studied in their curriculum to a real-world scenario. The scientific way of solving the problems and ability to apply it to find alternative solutions for the problems will help them in their professional life. This course will help to inculcate leadership skills, decision making, participative learning, resource management, cost considerations, documentation and report writing skills with effective communication.

Course Outcomes: Student should be able to:

CO1	Propose projects with innovative ideas in a clear and concise manner
CO2	Identify and summarize an appropriate list of literature review, analyze previous knowledge and relate them to current project
CO3	Plan and coordinate work in a group.
CO4	Implement the skills acquired in the previous semesters to solve complex engineering problems.
CO5	Test the designed project model and evaluate its performance.
CO6	Communicate effectively in oral or written format to present the working of their project/product.

Course Details:

1. Activity plan

Sr.No.	**Activity**	**Week No**
1	Prepare activity plan	1
2	Allocation of work responsibility to individual/team	2
3	Visits to Industries / Institutions / Market/field work/sites	3
4	Collection of Data /Survey/Analysis	4
5	Preparation of preliminary work	5,6
6	Development of Project	7,8,9,10
7	Consolidation of work allotted to individual or team	11
8	Presentation of initial draft: pre submission draft	12
9	Final Project Report: Printed: Submission: soft & Hard copy	13
10	Demonstration of project	14
11	Group presentation of project work at the time of final evaluation	15

The project work along with project report should be submitted as part of term work in third year fifth semester on or before the term end date.

2. Project Execution:

1. Guide shall monitor the work and help the students from time to time.

2. A project diary is to be maintained by each student, giving details of planning, work executed, information collected etc., on weekly basis and the same should be shown to the guide concerned

4. The guide should maintain a record of progressive / continuous assessment of project work and observe the progress of each group member on weekly basis.

5. The same shall be kept ready for submission to the external examiner before the final examination.

3. Project Report:

1. The student shall get the initial draft copy of the project approved from the Project Guide.

2. Structure: It shall be as follows

Project report structure

- **Title page**
- **Inner title page (white)**
- **Certificate**
- **Certificate from Industry**
- **Index/Content/Intent**
- **List of Abbreviations/Symbols**
- **List of Figures**
- **List of Graphs**
- **List of Tables**
- **List of if any other inclusion**
- **Introduction**
- **Literature Survey/Review**
- **System Development**
- **Performance Analysis**
- **Conclusion**
- **References**
- **Appendices**
- **Acknowledgement**

1. Introduction (2-3 pages)

1.1 Introduction

1.2 Need/Necessity/Motivation

1.3 Objectives

2. Literature survey/review (5-10 pages)

Related information available in standard Books, Journals, Transactions, and InternetWebsites.

3. System development (20-25 pages)

- The reporting shall be presented in one or more chapters with appropriate chapter titles.
- Experimental setups, procedures adopted, techniques developed, methodologies adopted. Important derivations/formulae
- Figures and tables should be presented immediately following their first mention in the text.

4. Performance analysis (5-15)

- **Test results**

5. Conclusions (1 page)

5.1. Conclusion

5.2. Future Scope

5.3. Applications/Utility

6. References (1-2 pages)

- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, pp.__.
- In case of web pages complete web page address with assessing date has to be enlisted
- List of references should be as per use in the text of the report

7. Appendices (5-7 pages)

- Related data or specifications or referred charts, details computer
- Code/program, etc.

8. Acknowledgement (1 page)

- Expression of gratitude and thankfulness for helping in completion of the said task with names starting from Guide, HoD, Principal and related persons Signed by the candidate.

9. General Guidelines

- Text should be printed on front and correct side of the watermark on quality white bond paper
- Paper size□A4
- Font : Times new roman
- Report heading :□ All capital—16 font
- Chapter heading :□ All capital—14 font
- Subchapter :– Title case□12 font
- Sub□subchapter : – First alphabet capital case□12 font

- Content : –Sentence case□12 font
- Title of the Report should not be more than two lines
- Spacing between lines□1.5
- Left Margin□1.5”
- Right Margin□1/2”
- Top Margin□1”

10 Flap

Suitable flap with name of the candidate, Department, Institute, symbol of can be used with nylon strip

CO Vs PO Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	**3**	**3**						**2**		
CO2	**3**	**2**							**3**	**1**
CO3			**2**			**3**				**3**
CO4	**3**	**3**	**3**	**3**	**3**				**3**	**2**
CO5	**3**	**3**	**3**	**3**	**2**	**1**	**2**		**3**	**3**
CO6	**2**	**2**	**3**		**1**	**2**	**1**		**2**	

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Curriculum Development,
Department of Information Technology

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Department of Information Technology

I/C, 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 Information Technology (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				
IT19311	Implant 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 assessment, **#** 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- 2hours, Creative Activity-2 hours

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

Coordinator
Curriculum Development,
Department of Information Technology

Head of Department
Department of Information Technology

In-Charge
Curriculum Development Cell

Principal

Programme : **Diploma in Information Technology (Sandwich Pattern)**										
Course Code: **IT19311**				Course Title: **Implant Training**						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	**40**	**--**	**20**	**--**	**---**	**---**		**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 AR26. 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:

There will always be the need of talented, innovative, and skilled manpower for industries to sustain in competitive market. Industries adopt different policies to get the employable manpower as per the demand. In-plant training, internship, apprenticeship etc. are some of the useful strategies for generating future talent pool for the industry. These programs not only helps fresh pass outs in gaining professional knowhow but also benefits, industries on fresh perspectives on business issues and even discovering future business leaders. Students passing out from technical institutions lack the experience, skills and confidence required by industries. In present scenario competition for job is rising exponentially and securing entry-level jobs is getting very difficult. Hence organizations like AICTE, BOAT, NATS, MEMS, State Boards of Technical education etc. are promoting industrial internship/industrial training at different level in technical institutes.

The main aim of In-plant training is to increase the employability skills of the students passing out from institute. For getting real time exposure of industrial environment six- month in-plant training is incorporated in the curriculum. The outcomes of the training will definitely a step ahead in making students employment-ready and will augment various attributes in students.

Course Outcomes: Student should be able to

CO1	Realize administrative, operational and social functioning of industrial organizations.
CO2	Follow industrial working practices, industrial safety practices, and industrial discipline.
CO3	Correlate the theory with industrial applications relevant to the courses studied.
CO4	Recognize responsibilities, ethical values, required interpersonal skills, problem solving skills, self-management and job management skills required while working as first line manager.
CO5	Effectively communicate through technical reports/projects report writing, presentation skills.

Course Content Details:

Unit No	Topics / Sub-topics

Information Technology students study various courses that enable them to work in number of fields related to Information Technology namely but not limited to software testing, networking, web design, cloud, Big data, GIS, Artificial intelligence, Machine learning etc.
Student will be placed as a trainee in different industries, organizations etc. for Implant training. During implant training, students may work as supporting member of project team, assist in small tasks, observe the procedures, collect the information etc. at Supervisory level.

IMPORTANT GUIDELINES FOR STUDENTS

- Students will be placed in different industries for in-plant training. Studenthas to complete minimum 20 weeks/ 800 hours (considering 5 days/week x 8 hrs shift x 20 weeks) of training.
- During In-plant training, student will be assigned to a polytechnic supervisor and industry supervisor. Polytechnic supervisor will visit the industry during training, guide the students, and resolve the issues of students if any. Industry supervisor will be the officer/shop in-charge/work manager etc., under whom student is working in industry daily.
- Student has to maintain in-plant training diary & in-plant training manual regularly.
- Student has to prepare the In-plant training report at the end of training under the supervision of polytechnic supervisor and industry supervisor.
- TW will consist of updated and signed/certified copies of daily in-plant training diary, weekly diary/in-plant training manual, and In-plant training report.
- Participating/completing specific project, mini project, special assignment etc. and including it in in-plant training report will be an added advantage for the students.
- During In-plant training, students have to follow the rules and regulations of respective industries. Student should not share any information/sketches/calculations/ formulae's etc., of company / department to anyone.
- Students i.e. in-plant trainees must take oral/written prior permission for any type leave from respective industry supervisors. Without permission students should not remain absent.
- Every student will be jointly assessed by polytechnic supervisor, and industry supervisor through mode of Oral examination as well as Term work, after successful completion of training.
- No students will be allowed to change the industry on his/her own.
- Each student has to abide safety rules of allocated industry. They have to follow safety procedures of industry.

Course Outcome:CO1 to CO6 Total Hours: Min. 20 weeks/800 Hrs

Documents/Activities to be completed during Implant Training :

Sr. No.	Unit Mapping	CO Mapping	Title of Activities	Remark
1		CO1-CO6	**Daily Diary :** Students will regularly maintain the daily diary noting daily activities completed during training, get it certified from concerned supervisors time to time. **Inplant Training Manual:** Students will carefully read the guidelines of Inplant training manual, follow the instruction given. Trainees will regularly maintain inplant training manual updated noting activities completed weekly during training, get it certified from concerned supervisors time to time. **Inplant Training Report:** At the end of the training, trainee will prepare inplant training report, detailing introduction of industry, products, activities performed/observed, assignments /projects participated/ completed, Skills achieved, and conclusions.	
			Total Hrs	**20 weeks /800hrs**

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3
CO6	3	3	3	3	2	2	3	3	3	3

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I/C, Curriculum Development Cell

Principal