Cusrow Wadia Institute of Technology
Pune 411 001

COMPUTER ENGINEERING DEPARTMENT

Multi Point Entry Credit System 2023

CURRICULUM

(W. E. F. June 2023)

Cusrow Wadia Institute of Technology, Pune 1.

CURRICULUM REVISION (2023)

1. Preamble:

- Cusrow Wadia Institute of Technology, Pune was granted Academic Autonomy in the year 1985 by Government of Maharashtra vide letter No. PTI 2483/119915(234)/TE-I (B) dated 27/2/1985.
- Initially the Institute adopted the Model Curriculum prepared by then TTTI, Western Region, Bhopal. Subsequently, the revisions in the curriculum were made as per the needs of the Society.
- The Institute adopted Multi Point Entry and Credit System w.e.f. June 1998.
- The earlier revision of the curriculum was carried out in the year 2018. Review of the curriculum adopted in 2018 was taken in the subsequent years. Necessary changes in the contents and detailing of the document as regards to the outcomes, implementation strategy and assessment were done by end of academic year 2022 - 23 . The present **NEP-2020** outcome based curriculum will come into force w.e.f. June 2023
- The feedback was taken from various stake holders and it was strongly felt that with the technology advancements the rapid changes are taking place in the field of Information Technology allied processes, a dynamic curriculum need to adopt the benefits of the fast changing expectations in the contents as well as the Teaching Learning Methodology.
- The Institute has strengthened the hardware and software which is constantly consolidated and upgraded to match the needs of the society in general and the Industries in particular.
- Students should be proficient in the use of computers and related softwares irrespective of the branch of Engineering they are studying. The students shall be made to make maximum use of software packages and use Internet to derive and update their knowledge.
- The contemporary needs of the user system and overall development of the students is the governing factor in the revision of 2023 NEP - 2020 outcome based curriculum.

2. Approach for Curriculum Revision:

- The curriculum should help the students to acquire professional skills and inculcate attitudes in order that the student will be able to discharge the role and functions effectively on the societal and employment front.
- Scientific system approach has been adopted in the revision of this outcome based curriculum.
- A curriculum revision model showing various steps undergone is presented.
- Analysis of the existing curriculum was done by taking feedback from the faculty implementing the curriculum, Alumni, Industry / Field Personnel, Courses Committee Members and the Experts in the field of Education.
- Entry behaviour of the students was assessed. Basic entry qualification for Diploma is SSC or equivalent. However, higher entry qualification like 12^{th} Science, 12^{th} MCVC, ITI etc. was also considered.
- Curriculum documents of MSBTE, other Boards and other Autonomous Institutions were studied for inclusion of new courses and analysis of contents of existing and newly inducted courses and also the implementation strategy.
- The curriculum is rationalised as per the AICTE and MSBTE norms and guidelines.
- The team members were identified for collecting feedback from stake holders and interviews

with Experts for noting the suggestions about the courses and necessary modifications Interaction was carried out with expert from Industry and Academia. The faculty members were trained by specialists in Technical Education System as regards to the Curriculum Revision Process.

3. Roles to be played and functions to be performed by a diploma holder:

- A Diploma holder may be employed in the Industry as a Technician or Supervisor for Production, Installation, Repairs and Maintenance. He also may be employed in drawing, estimation or as an Assistant in IT related activities. He may be an Entrepreneur, be assigned a job of Purchase/Marketing Department. Diploma holder should have basic knowledge of the various subjects of his branch in Engineering and also the related Inter-disciplinary subjects. He should be aware of the present technologies and be able to adopt the changes in future. He shall acquire the necessary skill sets in the Engineering subjects.
- His role in the Society is that of a responsible individual and should conduct himself as regards the values and cultures. He should acquire the necessary professional, presentation and managerial Skills.

4. Outcome Based Education (OBE)

- The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher-education system in India. It means that an Engineering graduate from India can be employed in any one of the other countries who have signed the Washington accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model.
- Cusrow Wadia Institute of Technology has adopted Outcome Based Education (OBE) model in revision of its curriculum effective from year 2023 . Development of curriculum based on OBE model is a noteworthy step towards further improvement in quality of technical education at polytechnic level in this institute.
- Outcome based education (OBE) is student-centered teaching learning model that focuses on measuring student's performance through outcomes. Outcomes include knowledge, skills and attitudes. Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behaviour a diploma holder is expected to attain upon completion of every course (Course Outcomes) and after three years of diploma program (Program Outcomes). Program specific outcomes (PSO's) are statements that describe what the graduates of a specific engineering program should be able to do.
- This OBE model measures the progress of the diploma holder in three parameters, which are
    - Program Educational Objectives (PEO)
    - Program Outcomes (PO)
    - Course Outcomes (CO)
- Program Educational Objectives (PEO) are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. PEO's are measured 4-5 years after graduation.
- Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time he/she completes diploma education. They must reflect the seven Graduate attributes as described by NBA for polytechnic education programs. Course outcomes are the measurable parameters which evaluates each students performance for each course that the student undertakes in every semester.

5. Analysing Job Functions and Deriving Curriculum Outcomes:

- Vision and Mission of the programme were framed.
- The role of Diploma holder as a technician on the job is analysed in the four 'Program Educational Objectives (PEO)' mapped with mission of the Department.
- The Program Outcomes (PO) suggested by NBA is incorporated with proper thought and understanding and two 'Program Specific Outcomes (PSO)' were defined after discussion with stake holders.
- Course Outcomes (CO) for each course is defined and mapped with POs and PSOs
- The courses common to several programmes and the courses relevant to particular programmes were classified under various categories.
- The overall course structure and Teaching Examination Scheme was prepared.
- The contents of various courses were finalised by considering the feedback from stake holders through interviews, and discussions.
- The course structure and the contents were validated by the Board of Studies.
- Study of the Diploma programmes offered by MSBTE, other State Boards and other Autonomous Institutions was done to widen the perspective.

6. Evolving the teaching learning process:

The following points were considered:

- No. of weeks – 15
- Average days per week- 5.5
- No. of contact hours per day – 7
- No. of hours per week for instruction and pre-decided Co-curricular activities – 40.
- Each course shall be taught for Fifteen weeks.

7. Course Categories:

- AEC (12)
- DSC (11)
- DSE (6)
- VEC(4)
- INP (2)
- Number of courses for a programme – 41
- Number of courses for award of class – 11
- Number of Elective courses – 6
- Number of credits to be earned for obtaining Diploma – 120 .
- One credit = Two hour of lecture or Two hour of practical per week for a course.
- Ratio of theory to practical hours per week : approx. 52 :48

8. Examination scheme:

- Theory paper – 70 marks
- Tests – 30 marks
- Formative &Self Assessment Work– 25,50,100 marks
- Practicals – 25,50 marks
- Viva voce - 25,50, 100 marks

- Project Work - 75 + 50 marks
- Grand total – 5300 marks
- Grand total of marks for award of class – 1800 .

9. Course-wise content detailing:

- For finalisation of course structure from Courses Committee, Examination Committee and Board of Studies, various processes in the Curriculum Revision Model were followed. Also the documents of MSBTE and Autonomous Polytechnics were referred.
- Contents were decided by taking into consideration, the expectations of the stake holders, specific needs of Industry, Interviews, Discussions and Experts opinions.
- Every course has a unique code e.g. R23CP1401. 'R23 ' means the course is from the curriculum revised in 2023. CP implies Computer Engineering Department will teach this course. '1' indicates that it is AEC Course Category in the programme structure. '4' means the course is to be taught by Computer Engineering programme. '01' is the serial number of the course in AEC Course Category.

  The 7th character in the above 9 digit code is assigned for the programme, e.g. 1 – Computer, 2 – Mechanical, 3 – Electrical, 4 – Computer and 5 – Electronics & Telecommunication Engineering and 7 – Common courses for all programmes taught by Science Department.
- A rationale giving the importance of the course in the curriculum is vividly explained. The proficiency expected to be developed through the course is defined. The course outcomes are derived indicating the purpose to teach the course.
- The inputs for student activities are included in most of the courses so that the students will be able to learn the contents beyond syllabus.
- The curriculum document prescribes learning resources for students e.g. Reference books, Textbooks, Websites, Handbooks, Printed notes etc.
- Use of Learning Management System, Audio Visual Aids be increased for enhancing the Teaching Learning Process.

10. Curriculum implementation strategy:

- Members of the faculty shall continuously undergo Induction Training Programme, Content upgrading programme conducted by ISTE, NITTTR and other Organisations.
- The faculty members will be deputed to attend Refresher courses and Training programmes so as to help them keep abreast with latest developments and technology.
- Faculty members will be trained/updated in respect of various aspects and methods of evaluation systems, paper setting etc.
- Faculty will be trained/updated for monitoring the curriculum implementation.
- Library will be constantly modernised with additions of latest titles and books .The Library will have open access to the students. Library will be open for extended hours. The Books Bank Facility will support the demand of the students.
- The Laboratory and Field Manuals will be structured and standardised so that the students can spend more time for doing practicals, understanding the significance, discussions and result analysis rather than only writing the journals.
- The Examination rules will be revised to suit the curriculum and will have similarity as regards to principles followed by MSBTE and other Examination bodies.
- The Evaluation Systems and marking schemes will be commensurate with the input hours and importance of the topics in the course.
- 24 X 7 – 50 MBPS internet connection is available for faculty, staff and students.Wi-Fi connectivity provided in laboratories.

- Uninterrupted Power Supply and captive power is made available to take over the load shedding.
- The laboratories, equipments and computers be maintained in working conditions.
- Industrial visits, Field visits, Study tours shall be arranged regularly in a preplanned and structured manner so as to have focus on technical aspects.
- Guest faculty should be invited to deliver lectures on recent trends, technologies.
- The students should imbibe various life skills, soft skills, learn stress management and adjust help and appreciate colleagues especially during group activities, study tours and visits etc.

Cusrow Wadia Institute of Technology Pune 1

Vision And Mission of The Institute

Vision

To be a resourceful institute that develops technically competent and socially responsible citizen for futuristic needs of industry and society.

Mission

M1: To impart technical knowledge and skills along with ethical and social values

M2: To continually enhance curricula and learning resources as per latest trends in technology.

M3: To develop the faculty and enable them to implement innovative teaching methods.

M4: To strengthen association with industry and alumni.

M5: To adopt and implement various e-governance practices for benefits of stake-holders.

Vision and Mission of the Computer Engineering Department

Vision

Vision : To be a centre of excellence for Computer Engineering education that provides value based quality technical education.

Mission

- To inculcate social and ethical values along with technical proficiency
- To enhance curricula in tune with technological developments
- To develop faculty and infrastructure for effective implementation of curricula
- To strengthen association with industry and alumni

Cusrow Wadia Institute of Technology, Pune 1.

Program Educational Objectives (PEOs)

PEO 1: Pursue career in Computer Software Design and Development.

PEO 2: Lead interdisciplinary projects.

PEO 3: Start own enterprise or be an IT consultant.

Program 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 analyse 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 analyse individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSO1: Troubleshoot hardware and network problems.

PSO2: Create web and multimedia applications.

PSO3: Pursue higher education for professional development and career growth.

What is Computer Engineering?

Almost every facet of our life, whether in industry, academic institutes, government organizations, health care, research, or domestic life, is dependent on Computers.

A Computer Engineer design and develop the hardware and software systems that have made computers important part of our day to day life. They research, design, develop, test, and oversee the installation of computer hardware and software and supervise its manufacture. The educational program prepares them to address current and future problems in various fields.

Importance of Computer Engineering Program:

A Computer Engineer studies the whole computer system in its entirety, and is equally comfortable working with both hardware and software. He also understands how the hardware and software interact with each other. This ability to work on both sides of the hardware/software interface makes the Computer Engineer uniquely qualified to conceive, design, and integrate complete computer systems from scratch.

The Diploma program in Computer Engineering provides students with a strong theoretical and practical background in both the hardware and the software aspects of computer-based systems, along with the engineering analysis, design, and implementation skills necessary to work between the two. The curriculum is based on an engineering philosophy, with emphasis on both, the hardware and software.

Objectives of Computer Engineering Program:

The objectives of the Computer Engineering program is to educate students in the core topics as well as in a broad set of specialties of Computer Engineering, to impart students with professional attributes that characterize a well-schooled engineer and citizen. The department achieves this through a balance of required courses and judicious choices of technical electives in three stages of studies in Computer Engineering. The first teaches the students basic or foundation courses, the second teaches the core courses and the third teaches in depth some specialized areas of computer engineering through choices of technical electives taken during the junior and senior year. Our objectives are:

- The students will apply their knowledge and skills to succeed in a computer engineering career and/or obtain an advanced degree.
- The students will function ethically and responsibly,
- The students will apply basic principles and practices of computing to successfully complete hardware and/or software related engineering projects to meet customer objectives.
- The students will apply the basic principles and practices of engineering in the computing domain to the benefit of society.

Modern Education Society's

Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses **MPECS R23 (Based on NEP2020)**

Programme Name: Diploma in Computer Engineering

Programme Code: CP	**With Effect From Academic Year:** 2023-24
Duration of Programme: 6 Semesters	**Duration:** 16 weeks
Semester: First	**Scheme:** R23

Sr. No	Course Title		Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme											
						Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)		Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
						CL	TL	LL						FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
														Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	BASIC MATHEMATICS		AEC	R23CP1701	6	4	2	-	2	8	4	3		30	70	100	40	-	-	-	-	25	10	125
2	BASIC SCIENCE	BASIC PHYSICS	DSC	R23CP2701	4	2	-	2	1	10	5	1.5	3	15	70*#	100	40	25	10	25@	10	25	10	250
		ENVIRONMENTAL CHEMISTRY	DSC			2	-	2	1			1.5		15				25	10	25@	10	25	10	
3	COMMUNICATION SKILLS (ENGLISH)		AEC	R23CP1702	0	3	-	2	1	6	3	3		30	70	100	40	25	10	-	-	25	10	150
4	ENGINEERING GRAPHICS		DSC	R23CP2201	2	2	-	2	-	4	2			-	-	-	-	25	10	50@	20	-	-	75
5	ENGINEERING WORKSHOP PRACTICE		SEC	R23CP6401	0	-	-	4	-	4	2			-	-	-	-	50	20	50@	20	-	-	100
6	FUNDAMENTALS OF ICT		SEC	R23CP6402	0	2	-	2	2	6	3			-	-	-	-	50	20	25@	10	25	10	100
7	YOGA AND MEDITATION		VEC	R23CP4701	1	-	-	1	1	2	1			-	-	-	-	25	10	-	-	25	10	50
Total					**13**	**15**	**2**	**15**	**8**	**40**	**20**			**90**	**210**	**300**		**225**		**175**		**150**		**850**

Abbreviations :
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note:
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

Modern Education Society's

Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses **MPECS R23 (Based on NEP2020)**

Programme Name: Diploma in Computer Engineering

Programme Code: CP	**With Effect From Academic Year:** 2023-24
Duration of Programme: 6 Semesters	**Duration:** 16 weeks
Semester: Second	**Scheme:** R23

Sr. No	Course Title	Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme											
					Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
					CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
												Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	APPLIED MATHEMATICS	AEC	R23CP1703	2	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100
2	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	AEC	R23CP1301	0	4	-	4	2	10	5	1.5	30	70*#	100	40	50	20	50@	20	50	20	250
3	PROGRAMMING IN C	AEC	R23CP1401	0	4	1	4	1	10	5	3	30	70	100	40	50	20	50#	20	25	10	225
4	LINUX BASICS	DSC	R23CP2401	0	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50
5	WEB PAGE DESIGNING	SEC	R23CP6403		2	-	4	2	8	4	-	-	-	-	-	50	20	50@	20	25	10	125
6	PROFESSIONAL COMMUNICATION	SEC	R23CP6701	0	-	-	2	-	2	1	-	-	-	-	-	25	10	25@	10	-	-	50
7	SOCIAL AND LIFE SKILLS	VEC	R23CP4401		-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
Total				**2**	**15**	**2**	**16**	**7**	**40**	**20**		**90**	**210**	**300**		**200**		**200**		**150**		**850**

Abbreviations :
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note:
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

Modern Education Society's
Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses MPECS **R23 (Based on NEP2020)**

Programme Name: Diploma in Computer Engineering

Programme Code: CP	**With Effect from Academic Year:** 2024-25
Duration of Programme: 6 Semesters	**Duration:** 16 weeks
Semester: Third	**Scheme:** R23

Sr. No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme										
						Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1.	DATA STRUCTURES	DS	DSC	R23CP2402	0	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175
2.	OBJECT ORIENTED PROGRAMMING WITH C++	OOPS	SEC	R23CP6404	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
3.	MICROPROCESSORS &ITS PROGRAMMING	MP	DSC	R23CP2403	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
4.	DATA COMMUNICATION	DC	DSC	R23CP2404	0	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
5.	USER INTERFACE PROGRAMMING	UIP	DSC	R23CP2405	0	2	-	2	-	4	2	-	-	-	-	-	50	20	50#	20	-	-	100
6.	ANIMATION TECHNIQUES	AT	AEC	R23CP1402	0	2	-	4	2	8	4	-	-	-	-	-	50	20	-	-	25	10	75
7.	INDIAN CONSTITUTION	IC	VEC	R23CP4402	0	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	25	10	25
Total					0	17	-	16	7	40	20	-	120	280	400	160	200	80	150	60	150	60	900

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4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category: Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

Modern Education Society's
Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses MPECS **R23 (Based on NEP2020)**

Programme Name: Diploma in Computer Engineering

Programme Code: CP | **With Effect from Academic Year:** 2024-25

Duration of Programme: 6 Semesters | **Duration:** 16 weeks

Semester: Fourth | **Scheme:** R23

Sr. No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme											
						Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1.	**Operating System**	OS	DSC	R23CP2406	-	4	-	2	-	6	3	3	30	70*#	100	40	25	10	25@	10	-	-	150
2.	**Database Management System**	DBMS	DSC	R23CP2407	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
3.	**Computer Networks**	CN	DSC	R23CP2408	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
4.	**Python Programming**	PP	AEC	R23CP1403	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
5.	**Java Programming**	JP	AEC	R23CP1404	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
6.	**Entrepreneurship Development & Marketing Management**	EDP & MM	SEC	R23CP6405	1	2	-	2	-	4	2	-	-	-	-	-	25	10	-	-	-	-	25
7.	**Ethics in Engineering Practice**	EEP	VEC	R23CP4403	-	2	-	-	2	4	2	-	-	-	-	-	-	-	-	-	25	10	25
Total					1	20	-	14	6	40	20	15	150	350	500	200	150	60	125	50	125	50	900

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3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category: Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

Modern Education Society's

Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses **MPECS R23 (Based on NEP2020)**

Programme Name: Diploma in Computer Engineering

Programme Code: CP	**With Effect From Academic Year:** 2025-26
Duration of Programme: 6 Semesters	**Duration:** 10 weeks
Semester: Fifth	**Scheme:** R23

Sr. No.	Course Title	Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme											
					Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
					CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
												Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	**Software Engineering (SE)**	DSC	R23CP2409	-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150
2	**Advanced Java Programming (AJP)**	AEC	R23CP1405	-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150
3	**PHP Programming**	AEC	R23CP1406	-	4	-	4	1	9	3	3	30	70	100	40	25	10	25#	10	25	10	175
4	**Seminar And Capstone Initiation (S&CI)**	AEC	R23CP1407	-	-	-	2	1	3	1	-	-	-	-	-	25	10	25@	10	25	10	75
5	**Internship (12 weeks)**	INP	R23CP5401	-	-	-		-	-	10	-	-	-	-	-	100	40	100#	40	-	-	200
Elective 1 (Any - One)																						
6	**Recent Trends in Computer Networks (RTCN)**	DSE	R23CP3401	-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150
6	**Database Architecture and Emerging Technologies (DA&ET)**	DSE	R23CP3402	-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150
6	**Fundamentals of Data Science (FDS)**	DSE	R23CP3403	-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150
Total				-	16	-	12	2	-	20	-	120	280	400	160	225	90	225	90	50	20	900

Abbreviations :
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note:
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 10 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) :
Skill Enhancement Course (SEC): , Generic Elective (GE) :

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Modern Education Society's
Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses MPECS R23 (Based on NEP2020)

Programme Name: Diploma in Computer Engineering

Programme Code: CP	**With Effect From Academic Year: 2025-26**
Duration of Programme: 6 Semesters	**Duration: 16 weeks**
Semester: Sixth	**Scheme: R23**

Sr. No.	Course Title	Course Type	Course Code	Total IKS Hrs for Semester	Learning Scheme					Credits	Assessment Scheme											
					Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
					CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
												Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	Industrial Management for IT Industry (IMIT)	AEC	R23CP1408	1	3	-	-	1	4	2	3	30	70	100	40	-	-	-	-	25	10	125
2	Emerging Trends In Computer Engineering (ETCE)	DSC	R23CP2410	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175
3	Machine Learning (ML)	DSC	R23CP2411	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
4	AI Tools and Techniques (ATT)	SEC	R23CP6406	-	2	-	4	-	6	3	-	-	-	-	-	50	20	25@	10	-	-	75
5	Software Testing Tools and Automation (STA)	SEC	R23CP6407	-	2	-	2	-	4	2	-	-	-	-	-	50	20	-	-	-	-	50
6	Capstone Project (CP)	INP	R23CP5402	-	-	-	2	2	4	2	-	-	-	-	-	50	20	50#	20	25	10	125
Elective 1 (Any - One)																						
7	Network And Information Security (NS)	DSE	R23CP3404	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
7	Cloud Computing (CC)	DSE	R23CP3405	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
7	Data Analytics and Visualization using R Programming (DAVR)	DSE	R23CP3406	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
Total				1	16	-	18	6	40	20	12	120	280	400	160	225	90	150	60	125	50	900

Abbreviations :
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note:
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

COMPUTER ENGINEERING DEPARTMENT

Course Type Code			Department Code	
1	**AEC**	Ability Enhancement Course	1	Civil Engineering (CE)
2	**DSC**	Discipline Specific Course	2	Mechanical Engineering (ME)
3	**DSE**	Discipline Specific Elective	3	Electrical Engineering (EE)
4	**VEC**	Value Education Course	4	Computer Engineering (CP)
5	**INP**	Internship/ Apprentice/ Project/ Community	5	Electronics & Telecommunication Engineering (EX)
6	**SEC**	Skill Enhancement Course	6	Computer Engineering & IOT (CI)
7	**GE**	Generic Elective	7	Science and Humanities (SC)
			8	Applied Mechanics (AM)

SR NO.	COURSE TYPE	COURSE CODE	COURSE NAME
1	**AEC**	R23CP1701	Basic mathematics
2	**AEC**	R23CP1702	Communication skills (English)
3	**AEC**	R23CP1703	Applied mathematics
4	**AEC**	R23CP1301	Basic electrical and electronics engineering
5	**AEC**	R23CP1401	Programming in c
6	**AEC**	R23CP1402	Animation techniques
7	**AEC**	R23CP1403	Python programming
8	**AEC**	R23CP1404	Java programming
9	**AEC**	R23CP1405	Advanced java programming
10	**AEC**	R23CP1406	PHP programming
11	**AEC**	R23CP1407	Seminar and capstone initiation
12	**AEC**	R23CP1408	Industrial Management for IT Industry (IMIT)

1	**DSC**	R23CP2701	BASIC PHYSICS
2	**DSC**	R23CP2702	ENVIRONMENTAL CHEMISTRY
3	**DSC**	R23CP2201	ENGINEERING GRAPHICS
4	**DSC**	R23CP2401	LINUX BASICS
5	**DSC**	R23CP2402	DATA STRUCTURES
6	**DSC**	R23CP2403	MICROPROCESSORS & ITS PROGRAMMING
7	**DSC**	R23CP2404	DATA COMMUNICATION
8	**DSC**	R23CP2405	USER INTERFACE PROGRAMMING
9	**DSC**	R23CP2406	Operating System
10	**DSC**	R23CP2407	Database Management System

SR NO.	COURSE TYPE	COURSE CODE	COURSE NAME
11	**DSC**	R23CP2408	Computer Networks
12	**DSC**	R23CP2409	Software Engineering (SE)
13	**DSC**	R23CP2410	Emerging Trends In Computer Engineering (ETCE)
14	**DSC**	R23CP2411	Machine Learning (ML)

1	**DSE**	R23CP3401	Recent Trends in Computer Networks (RTCN)
2	**DSE**	R23CP3402	Database Architecture and Emerging Technologies (DA&ET)
3	**DSE**	R23CP3403	Fundamentals of Data Science (FDS)
4	**DSE**	R23CP3404	Network And Information Security (NS)
5	**DSE**	R23CP3405	Cloud Computing (CC)
6	**DSE**	R23CP3406	Data Analytics and Visualization using R Programming (DAVR)

1	**VEC**	R23CP4701	YOGA AND MEDITATION
2	**VEC**	R23CP4401	SOCIAL AND LIFE SKILLS
3	**VEC**	R23CP4402	INDIAN CONSTITUTION
4	**VEC**	R23CP4403	Ethics in Engineering Practice

1	**INP**	R23CP5401	Internship (12 weeks)
2	**INP**	R23CP5402	Capstone Project (CP)

1	**SEC**	R23CP6401	ENGINEERING WORKSHOP PRACTICE
2	**SEC**	R23CP6402	FUNDAMENTALS OF ICT
3	**SEC**	R23CP6403	WEB PAGE DESIGNING
4	**SEC**	R23CP6701	PROFESSIONAL COMMUNICATION
5	**SEC**	R23CP6404	OBJECT ORIENTED PROGRAMMING WITH C++
6	**SEC**	R23CP6405	Entrepreneurship Development & Marketing Management
7	**SEC**	R23CP6406	AI Tools and Techniques (ATT)
8	**SEC**	R23CP6407	Software Testing Tools and Automation (STA)

For Example	Revision 23	Dept. Code or Offered by	Course Type	Conducted by (Dept. Code)	Sr. No.
Basic Mathematics	R23	CE	1	7	01
Engineering Drawing	R23	CE	6	2	03
Engineering Mechanics	R23	CE	2	8	01

Index

Sr. No.	Course Code	Course Name	Page No.
	SEMESTER I		01
1.	R23CP1701	Basic Mathematics	02
2.	R23CP2701	Basic Science	09
3.	R23CP1702	Communication Skills	19
4.	R23CP2201	Engineering Graphics	26
5.	R23CP6401	Engineering Workshop Practice	32
6.	R23CP6402	Fundamentals Of ICT	37
7.	R23CP4701	Yoga And Meditation	47
	SEMESTER II		51
1.	R23CP1703	Applied Mathematics	52
2.	R23CP1301	Basic Electrical And Electronics Engineering	57
3.	R23CP1401	Programming In C	66
4.	R23CP2401	Linux Basics	74
5.	R23CP6403	Web Page Designing	80
6.	R23CP6701	Professional Communication	87
7.	R23CP4401	Social And Life Skills	92
	SEMESTER III		96
1.	R23CP2402	Data Structure Using C	97
2.	R23CP6404	Object Oriented Programming Using C++	105
3.	R23CP2403	Microprocessors & Its Programming	114
4.	R23CP2404	Data Communication	121
5.	R23CP2405	User Interface Programming	127
6.	R23CP1402	Animation Techniques	132
7.	R23CP4402	Indian Constitution	139
	SEMESTER IV		147
1.	R23CP2406	Operating System	148
2.	R23CP2407	Database Management System	157
3.	R23CP2408	Computer Networks	166
4.	R23CP1403	Python Programming	174
5.	R23CP1404	Java Programming	182
6.	R23CP6405	Entrepreneurship Development & Marketing Management	190
7.	R23CP4403	Ethics In Engineering Practice	197
	SEMESTER V		202
1.	R23CP2409	Software Engineering	203
2.	R23CP1405	Advance Java Programming	209
3.	R23CP1406	PHP Programming	216
4.	R23CP1407	Seminar And Capstone Initiation	224
5.	R23CP5401	Internship	229
6.	R23CP3401	Recent Trends In Computer Networks	236
6.	R23CP3402	Database Architecture and Emerging Technologies	246
6.	R23CP3402	Fundamentals of Data Science	256
	SEMESTER VI		261
1.	R23CP1408	Industrial Management For IT Industry	262
2.	R23CP2410	Emerging Trends In Computer Engineering	268
3.	R23CP2411	Machine Learning	276
4.	R23CP6406	AI Tools And Techniques	287
5.	R23CP6407	Software Testing Tools And Automation	295
6.	R23CP5402	Capstone Project	301
7.	R23CP3404	Network and Information Security	307
7.	R23CP3405	Cloud Computing	314
7.	R23CP3406	Data Analytics And Visualization Using R Programming	320

SEMESTER 1

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Diploma Programme	Computer Engineering
Course Name	Basic Mathematics
Course code	R23CP1701
Course Category	Ability Enhancement Course
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	2	-	2	8	4	3 hr	30	70	100	40	-	-	-	-	25	10	125

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE-

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable and capable of making significant contributions to the branch-specific problems.

B) EXPECTED SKILL/s –

Apply the concept of Mathematics to solve industry-based technology problems.

C) COURSE OUTCOMES (COs)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Apply the concepts of algebra to solve engineering (discipline) related problems.
CO2 - Utilize trigonometry to solve branch specific engineering problems.
CO3 - Solve area specific engineering problems under given conditions of straight lines.
CO4 - Apply differential calculus to solve discipline specific problems.
CO5 - Use techniques and methods of statistics to crack discipline specific problems.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Algebra** 1.1 Solve the given simple problem based on laws of logarithm. 1.2 Solve given system of linear equations using matrix inversion method. 1.3 Obtain the proper partial fraction for the given simple rational function. 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics.	1.1 Logarithm: Concept and laws of logarithm. 1.2 Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3x3, adjoint and inverse of matrices. 1.3 Matrices: Solution of simultaneous equations by matrix inversion method. 1.4 Partial Fractions: Types of partial fraction based on nature of factors and related Problems. 1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics).	**12**	**15**	**CO1**
2	**Trigonometry** 2.1 Apply the concept of Compound angle, allied angle to solve the given simple engineering problem(s). 2.2 Apply the concept of multiple angles and Sub- multiple angles to solve the given simple engineering related problem(s). 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios. 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.	2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles. (without proof) 2.2 Factorization and De factorization formulae. (without proof). 2.3 Inverse Trigonometric Ratios and related problems. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India. 2.6 Indian Trigonometry: Basic Indian Trigonometry- Introduction and Terminology (From Ancient Beginnings to Nilakantha). 2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.	**14**	**10**	**CO2**
3	**Straight Line** 3.1 Calculate angle between given two	3.1 Straight line and slope of straight line: Angle between two lines,	**08**	**10**	**CO3**

	straight lines. 3.2 Formulate equation of straight lines related to given engineering problems. 3.3 Identify perpendicular distance from the given point to the line. 3.4 Calculate perpendicular distance between the given two parallel lines. 3.5 Use geometry given in Sulabasutras to solve the given problems.	Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form. 3.3 Perpendicular distance from a point on the line. 3.4 Perpendicular distance between two parallel lines. 3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).			
4	**Differential calculus** 4.1 Solve the given simple problems based on functions. 4.2 Solve the given simple problems based on rules of differentiation. 4.3 Obtain the derivatives of composite, implicit, parametric, functions.	4.1 Functions : Concept of function and simple examples. 4.2 Derivatives: Rules of derivatives such as sum, Product, Quotient of functions. 4.3 Derivative of composite functions (chain Rule), implicit and parametric functions.	**12**	**15**	**CO4**
5	**Differential Calculus** 5.1 Apply the concept of differentiation to find given equation of tangent and normal. 5.2 Apply the concept of differentiation to calculate maxima, minima of the given function. 5.3 Familiar with concept of calculus given in Indian Mathematics.	5.1 Applications of derivative: Second order derivative without examples, Equation of tangent and normal. 5.2 Problems on Maxima and minima. 5.3 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers. (Indian Mathematics).	**06**	**10**	**CO4**
6	**Statistics** 6.1 Obtain the range and coefficient of range of the given grouped and ungrouped data. 6.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s). 6.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. 6.4 Justify the consistency of given simple sets of data.	6.1 Range, coefficient of range of discrete and grouped data. 6.2 Mean deviation and standard deviation from mean of grouped and ungrouped data. 6.3 Variance and coefficient of variance. 6.4 Comparison of two sets of observation	**08**	**10**	**CO5**

E) TUTORIAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Tutorial Titles	Unit No.	Hrs.
1	Solve simple problems of Logarithms based on given applications.	I	2
2	Solve elementary problems on Algebra of matrices.	I	2
3	Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	I	2

4	Solve solution of Simultaneous Equation using inversion method.	I	2
5	Resolve into partial fraction using linear non-repeated, repeated, and irreducible quadratic factors.	I	2
6	Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes.	II	2
7	Practice problems on factorization and de factorization and Inverse trigonometric functions.	II	2
8	Practice problems on equation of straight lines using different forms.	III	2
9	Solve Problems of derivatives on rules of derivatives.	IV	2
10	Solve problems of derivatives of composite function.	IV	2
11	Solve problems to find derivatives of implicit function and parametric function.	IV	2
12	Solve problems based on finding equation of tangent and normal and maxima, minima for engineering applications.	IV	2
13	Solve problems on finding range, coefficient of range and mean deviation for given applications.	V	2
14	Solve problems on standard deviation, coefficient of variation and comparison of two sets.	V	2
15	Calculate the Standard Deviation of the given data for given engineering applications.	V	2

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Micro project

- Create a function that takes a matrix as input and returns its inverse matrix if it exists. Also implement a program that finds the inverse of a square matrix.
- Collect the Data of Marks obtained by your class in mid semester test. Compute the variance and coefficient of variance of the data and interpret the result using the free open source software Wolfram alpha.
- Prepare the model using the concept of tangent and normal bending of roads in case of sliding of a vehicle, express geometrically the same through any open source software.
- A window in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window to admit maximum light through the whole opening, prepare a model using concept of Maxima and Minima for the above problem and verify the result.
- Visualize trigonometric waveforms and create animations utilizing sine or cosine functions and make a presentation.
- Develop a program of trigonometric function calculator that computes sine, cosine, and tangent values.
- Prepare models using trigonometry based on at least 10 engineering problems.
- Prepare charts using determinant to find area of regular shapes.
- Design a puzzle based on matrices. Create a grid of numbers and operations.
- Develop a math game based on operations of matrices.

Assignment

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programming using any open source software to verify the result.
- Collect examples on coding theory using applications of matrices and prepare a pdf file.

- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdf file.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of y= x^sinx and visualize the graph of the function and its derivative using any open source software geometrically.
- Find height of room or distance between two pillars by using concept of straight line.
- Collect at least 10 examples based on real world applications of standard deviation/variance.
- Collect at least 10 examples based on real world uses of applications of derivative.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

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H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Aligned COs	R-Level	U-Level	A-Level	Total Marks
1	I	Algebra	CO1	3	8	4	15
2	II	Trigonometry	CO2	2	4	4	10
3	III	Straight Line	CO3	2	4	4	10
4	IV	Differential Calculus	CO4	3	8	4	15
5	V	Differential Calculus	CO4	2	4	4	10
6	VI	Statistics	CO5	2	4	4	10
Grand Total				**10**	**28**	**32**	**70**

I) ASSESMENT TOOL –

- **Formative assessment**
  1) 2 unit test , each of 30 marks and average of 2 unit test
- **Summative Assessment**
  End semester Assessment Theory Examination of 70 marks
- **Self learning Assessment**
  For self learning 25 marks project/assignments.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi , 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering	S Chand publication New Delhi 2008

Sr. No.	Author	Title	Publisher
		Mathematics	ISBN: 9788121903455
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi 110016. ISBN 978-93-80250-06-9
7	George Gheverghese Joseph	Indian Mathematics Engaging with the World from Ancient to Modern Times	World Scientific Publishing Europe Ltd. 57 ISBN 978-17-86340-61-0
8	Deepak Singh	Mathematics-I	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
9	Garima Singh	Mathematics-II	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
10	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)
11	Gunakar Muley	SansarKe Mahan Ganitagya	First Edition, Rajkamal Prakashan, ISBN-10. 8126703571, ISBN-13. 978-8126703579.
12	T.S. Bhanumurthy	A Modern introduction to Ancient Indian Mathematics	New Age International Private Limited, 1 January 2008 ISBN- 10. 812242600X, ISBN- 13. 978-8122426007
13	M.P. Trivedi and P.Y. Trivedi	Consider Dimension and Replace Pi	Notion Press; 1st edition (2018), ISBN-978-1644291795

- **SOFTWARE/ TOOLS/ MODELS**
  Open-source software like SageMaths, MATHS3D,
  GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq 2.13), ORANGE, wolfram alpha can be used for Algebra, Calculus, Trigonometry, and Statistics respectively.

- **WEBSITES LINKS**

Sr. No.	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/ -SCI Lab	Signal processing, statistical analysis, image enhancement.
3	www.mathworks.com/product/matlab/ -MATLAB	Applications of concepts of Mathematics to coding.

Sr. No.	Link / Portal	Description
4	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, Google Sheets.
5	https://ocw.mit.edu/	MIT Course ware
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.
8	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) in Mathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

K) CO-PO Matrix –

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1 Troubleshoot hardware and network problems	PSO- 2 Create web and multimedia applications.	PSO- 3 Pursue higher education for professional development and career growth.
CO1	2	1	-	-	-	-	1	1	-	1
CO2	2	1	-	-	-	-	1	-	-	-
CO3	1	1	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	1	1	-	1
CO5	2	1	-	-	-	-	1	-	1	1
Legends :- High:03, Medium:02,Low:01, No Mapping: -										

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CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Basic Science
Course code	R23CP2701
Course Category	Discipline Specific Course (DSC)
Credits	5

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	1	5	5	1.5	15	35*#	100	40	25	10	25@	10	25	20	250
2	-	2	1	5	5		15	35*#	100	40	25	10	25@	10	25	20	

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE –
Diploma engineers have to deal with various materials, methods and machines. Adequate knowledge of basic principle of Physics and Chemistry will help the students to understand the concepts better in any field of engineering. The course will develop analytical capabilities of students so that they can characterize transform and use material in engineering and apply knowledge gained in solving related engineering problems. It will develop the habit of scientific reasoning in students so that they can work with open and enquiring mind. They must learn and apply the concepts and principles of science like current electricity, semiconductor, heat and temperature, LASERS,

B) COURSE OUTCOMES (COs) –
Students will be able to achieve & demonstrate the following COs on completion of course based learning
CO1 - Estimate errors in measurements of a physical quantity measured with appropriate measuring instruments.
CO2 - Analyze the physical properties of materials for selecting appropriate material for appropriate applications.

CO3 - Use equipments based on principles of LASER and Optical fibre in industrial application.
CO4- Analyze core environmental chemistry principles (air, water, soil) and their impact on electronics manufacturing
CO5- Design e-waste management strategies, evaluate energy source impacts, and propose sustainable energy and storage solutions.
CO6- Apply environmental regulations and compliance, and evaluate emerging green technologies for sustainable electronics engineering.

C) COURSE CONTENT –

Unit. No	Topics and Sub-Topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX	CO Mapped
1.	**Unit I : Units and Measurements** 1.1 Physical quantities, fundamental and derived physical quantities with examples. Unit of physical quantity, fundamental units with examples and derived units with examples. 1.2 System of units (C.G.S., M.K.S., F.P.S. and S.I.).Rules and conventions for writing units in SI system.Tables of fundamental and derived S.I. units. Multiples and sub-multiples of units. Significant figures and rules for determining significant figures. 1.3 Dimensions and dimensional formulae. 1.4 Errors and types of errors: Instrumental error, systematic error and random error. Methods for minimization of errors. 1.5 Estimation of errors: (Absolute error, average absolute error, relative error and percentage error). Propagation of errors in measurement. Numericals.	**1a.** Describe the concept of physical quantities with relevant unit of measurement. **1b.** State various systems of units and its need for the measurement of the given physical quantities. **1c.**Determine the dimensions of given physical quantities. **1d.** State the error in the given measurement with justification.	**7**	**9**	**CO1**
2.	**Unit II : Electricity, Magnetism and Semiconductor** 2.1 Concept of charge, Coulomb's inverse square law, electric field, electric lines of force and their properties, electric field intensity, electric potential and potential difference Numericals. 2.2 Electric current, Ohm's law, specific resistance, resistance using colour code, laws of series and parallel resistance. Numericals. 2.3 Heating effect of electric current, Joule's law, electric power, electric energy in kWh, electric bill Numericals.	**2a.**Calculate electric field, potential and potential difference of the given static charge. **2b.**Apply laws of series and parallel combination in the given electric circuits. **2c.**Explain the heating effect of the electric current. **2d.**Describe the concept of given magnetic intensity and flux with relevant units. **2e**.Distinguish the given	**13**	**14**	**CO2**

	2.4 Magnetic field, magnetic field intensity and their units, magnetic lines of force and their properties, magnetic flux. 2.5 Conductors, semiconductors, insulators and their energy band diagrams. 2.6 Intrinsic (pure) semiconductor, extrinsic (impurity doped) semiconductors, pentavalent impurity doped N-type semiconductor, trivalent impurity doped P-type semiconductor, p-n junction diode and types of junction diode. 2.7 Forward and reverse biasing of p-n junction diode, I-V characteristics of p-n junction.	conductors, semiconductors and insulators on the basis of energy bands. **2f**. Explain the I-V characteristics and applications of the given p-n junction diodes.			
3.	**Unit III : Heat, Laser and Optical Fibre** 3.1 Heat and units of heat, calorie-joule conversion, latent heat and sensible heat. Temperature and temperature scales, absolute zero temperature, relation between Celsius, Fahrenheit and Kelvin scales. Difference between heat and temperature Numericals. 3.2 Conduction, flow of heat along a bar, steady state of temperature. Coefficient of thermal conductivity by Searle's method (for good conductor).Comparison of conduction, convection and radiation. 3.3 Boyle's law, Charles' law and Gay-Lussac's law. General gas equation. Numericals. 3.4 Laser: Excitation of particle, optical pumping, non-radiative and radiative transitions, spontaneous and stimulated emission, population inversion. 3.5 Types of lasers: Solid state laser (Ruby laser), Gas laser (Helium-Neon laser), Semiconductor laser, uses of lasers. 3.6 Basic optical laws: Reflection and refraction, laws of reflection and refraction, refractive index, Total Internal Reflection (TIR), critical angle and conditions for TIR. Applications of TIR in optical fibre. 3.7 Optical fibre: Principle, construction and working of optical fibre. Types, properties and applications of optical fibres.	**3a**. Convert the given temperature in different temperature scales. **3b.** Distinguish the properties of the good and bad conductors of heat. **3c**. Relate the characteristics of the three gas laws. **3d**. Determine the ratio of specific heats for the given gas materials. **3e.** Describe the phenomena of total internal reflection for the given mediums. **3f.** Describe light propagation in the given type of optical fibre.	**10**	**12**	**CO3**
4.	**Unit IV : Introduction to Environmental Chemistry** 4.1 Basic concepts and definitions. Importance of environmental chemistry in electronics and computer disciplines.	**4a.** A study of the composition of the Earth's atmosphere, greenhouse gases and climate change, **4b.** water purification and	**6**	**9**	**CO4**

	4.2 Atmospheric chemistry: Composition of Earth's atmosphere, greenhouse gases and climate change, air quality monitoring using technology, air pollution and its effects on electronics. 4.3 Water chemistry: Water pollution sources and types, water treatment and purification methods, data analysis in water quality monitoring, impact of water quality on electronics manufacturing. 4.4 Soil chemistry: Soil contamination and remediation, heavy metal toxicity and its relevance to computer components, soil erosion and conservation. Role of electronics in soil and sediment testing.	treatment methods, and the impact of water quality on electronics manufacturing. **4c.** Heavy metal toxicity in computer components, soil erosion, and soil conservation.			
5.	**Unit V : Chemistry of Electronic Waste (E-Waste)** 5.1 Generation and disposal of e-waste, hazardous materials in electronic devices, recycling and sustainable practices, e-waste management and recycling in India and abroad. 5.2 Chemistry of energy sources: Fossil fuels and their environmental impact, fuel combustion, greenhouse gas emissions and climate change, carbon capture and storage. 5.3 Renewable energy sources and their role in electronics, green computing and energy efficiency, solar energy (photovoltaic), wind energy (wind turbines), biomass and biofuels. 5.4 Nuclear energy and radioactive waste: Nuclear fission reactions, radioactive waste management, safety and environmental concerns. 5.5 Energy storage and batteries: Electrochemistry of batteries, environmental impact of battery production and disposal, emerging battery technologies.	**5a.** E-waste generation and disposal, Hazardous materials in electronic devices, **5b.** Recycling and sustainable practices, E-Waste Management and Recycling in India. **5c.** Impacts of fossil fuels on the environment, combustion of fuel, greenhouse gas emissions, climate change, carbon capture. **5d**. The utilization of sun powered energy (photovoltaics), wind energy (wind turbines), biomass and biofuels are wellsprings of sustainable power.	**12**	**12**	**CO5**
6	**Unit VI : Environmental Regulations and Compliance** 6.1 Overview of environmental regulations related to electronics manufacturing. 6.2 Role of government agencies in enforcing compliance, international standards and agreements. 6.3 Emerging technologies for sustainable	**6a.** Review of the environmental rules controlling the manufacture of electronics, as well as the duty of governmental bodies to enforce international agreements and standards.	**12**	**14**	**CO6**

	electronics: Green materials, energy-efficient manufacturing, nanotechnology, flexible and printed electronics, energy harvesting, biodegradable electronics, low-power electronics, wireless charging and power transfer, IoT and smart systems, renewable energy integration.	Green materials **6b.** Energy-efficient manufacturing, nanotechnology, flexible and printed electronics, energy harvesting, biodegradable electronics, low-power electronics, wireless charging and power transfer, internet of things and smart systems **6c.**Integration of renewable energy sources are some of the technologies that are being used.			

D) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Practical Outcomes	Unit No./CO	Hrs.
1	Know your Physics Laboratory, use of Scientific Calculator and interpretation of Graph	-	2
2	Measurement of (i) Length, Breadth and Height of a block ,(ii) Internal, External diameter and Height of a hollow cylinder using Vernier Callipers of different least counts.	I	2
3	Measurement of (i) Diameter of Sphere and Wire, (ii) Thickness of a plate by using Micrometer Screw Gauge.	I	2
4	Measurement of (i) Radii of concave and convex surfaces, (ii) Thickness of plate by using Spherometer.	I	2
5	Verification of ohms law by voltmeter ammeter method.	II	2
6	Measurement of Specific resistance by voltmeter ammeter method.	II	2
7	Verify resistance of a carbon resistor by colour code and multi-meter method	II	2
8	Measurement of Resistance in series.	II	2
9	Measurement of Resistance in parallel.	II	2
10	Magnetic lines of forces of Bar Magnet.	II	2
11	Study of PN junction diode in forward bias mode and reverse bias mode	II	2
12	Determination of co-efficient of thermal conductivity of a good conductor by Searle's method.	III	2
13	Verification of Boyle's law.	III	2

14	Measurement of divergence of light beam by using laser.	III	2
15	Study the phenomenon of Total Internal Reflection and determine critical angle of incidence.	III	2
16	Determination of Hardness in a sample of water	IV	2
17	Identify and analyze materials used in the manufacturing of a PCB	IV	2
18	Determination of % nutrient in soil	IV	2
19	Production of Bio-ethanol from Biomass.	V	2
20	Identifying Greenhouse Gases	V	2
21	Identifying renewable energy sources.	V	2
22	Measurement of air quality	V	2
23	Dissolved Oxygen	V	2
24	pH of Soil Samples	VI	2
26	Water Holding Capacity of soil	VI	2
27	Soap Vs Detergent Biodegradability	VI	2
28	Effect of acid rain on different material	VI	2

E) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Micro project:

1) Series and parallel resistances: Prepare models for combination of series and parallel resistances.
2) Magnetic flux: Prepare models to demonstrate magnetic lines of lines of forces of different types of magnets.
3) Vernier Callipers: Prepare prototype vernier calliper of desired least count using card board sheet.
4) Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models to conductor and insulator.
5) Gas laws: Prepare models to demonstrate Boyle's laws, Charle's Law and Gay Lussac's law using household material.
6) Carbon resistors: Determine the resistance and tolerance of carbon resistors using colour codes and multi-meter.
7) Thermal conductivity: Take different metallic plates of various metals and calculate rate of flow of heat.
8) Temperature sensor: Use Temperature sensor IC LM 35 to measure temperature of given body in various environment.
9) Mobile applications: Use mobile applications for measurements of different physical quantities For
10) Optical Fiber and TIR: Prepare model to demonstrate total internal reflection.

11) LDR: Use Light dependent resistor for measuring the intensity of light.
12) Types of bonds: Prepare chart and models displaying different types of bonds with examples.
13) Prepare a chart for showing different types of bonds or molecules.
14) Use of chemicals and preparations of solutions.
15)Use of instruments and machines.
16) Use of technique for calliberations.
17) Prepare journal of practical performed in the laboratory.
18) The micro project has to be environmental application based, laboratory-based or field-based as suggested by Teacher.
19) Perform a survey on various themes of hydropower models and measure the mechanical energy and hydroelectric power generation..
20) Prepare Wind Turbine project to generate electricity and measure voltage and current produced and it's chemical components.
21) Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of E-waste Topics. (Subject teacher shall assign a presentation to be prepared by each student).
22) Carry-out Survey report on different industrial visits.

F) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calipers: Range : 0-150mm , Resolution: 0.1mm	1
2	Micrometer screw gauge : Range : 0-25mm, Resolution: 0.01mm, Accuracy ±0.02mm or better	2
3	Battery eliminator : 0- 12 V ,2A	3,4,5,6,8,9,10,12
4	Digital multimeter : 3 1/2 digit display, 9999 counts, digital multimeter measures: Vac, Vdc (1000V max) , DC A, AC A(10 amp max), Resistance (0 - 100 MOhm	3,4,5,6
5	Resistance Box: 4 decade ranges from 1 ohm to 1K,accuracy 0.1 % - 1 %	3,4,5,6
6	Joule's calorimeter : well insulated "mechanical equivalent of heat apparatus" in wooden box, , digital / analog thermometer,	10,12
7	Boyle's apparatus: U tube manometer , barometer	11
8	Ammeter 0-2 amp voltmeter-0-5v DC	19,20,21,22,23
9	Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt	19,20,21,22,23,24,25,30
10	Redwood viscometer-I	26
11	Cleveland open cup apparatus	28
12	Abel's close cup apparatus	29
13	Electric oven inner size 18''x18''x18''; temperature range 100 to 2500 C. with the capacity of 40 lt.	

G) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE –
(Specification Table)

Unit No	Course Outcome	Unit Title	Teaching Hours	Distribution Of Theory Marks			
				R LEVEL	U LEVEL	A LEVEL	TOTAL
I	**CO 1**	Units and Measurements	7	2	3	4	9
II	**CO 2**	Electricity , Magnetism and Semiconductor	13	3	5	6	14
III	**CO 3**	Heat ,Laser and Optical fiber	10	2	4	6	12
IV	**CO4**	Introduction to Environmental Chemistry	6	2	3	4	9
V	**CO5**	Chemistry of Electronic Waste (e-waste) and Energy Sources	12	3	5	6	12
VI	**CO6**	Environmental Regulations and Compliance	12	3	4	5	14
		Total	60	15	24	31	70

H) ASSESMENT TOOL –

- **Formative assessment**
  1) 2 unit test , each of 30 marks and average of 2 unit test
     (15 marks Physics +15 marks Env.Chem Chemistry)
  2) For laboratory learning 50 marks
     (25 marks Physics +25 marks Env. Chemistry)
- **Summative Assessment**
  1) End semester Assessment for laboratory learning
     (25 marks Physics +25 marks Chemistry)
  2) End semester Assessment for online Theory Examination (MCQ)
     (35 marks Physics +35 marks Env. Chemistry)
- **Self learning Assessment**
  For self learning 50 marks
  (25 marks Physics +25 marks Env. Chemistry)

I) LEARNING RESOURCES –

- **BOOKS**

SR. NO.	AUTHOR	TITLE	PUBLISHER
1	J.V.Naralikar, A.W.Joshi	Physics Textbook XI (part1 &2)	National Council of Education Research and Training New Delhi
2	J.V.Naralikar, A.W.Joshi	Physics Textbook XII (part1 &2)	National Council of Education Research and Training New Delhi
3	D.Haliday& R. Resnick	Fundamentals of Physics	Jhon Wiley and Sons , USA
4	R.K.Gaur, S.L.Gupta	Engineering Physics	Dhanpat Rai and Sons Publications.
5	A. K. De	Environmental Chemistry	New Age International Publishers
6	Shikha Agarwal	Engineering Chemistry: Fundamentals and Applications	Cambridge University Press (2016)
7	Gilbert M. Masters and Wendell P. Ela	Environmental Engineering and Science	Prentice Hall
8	Date-Joag-Kalaskar	Environmental Chemistry T.Y.B.Sc semestervIII	Manali Publication , pune 30

- **WEBSITES LINKS**

1) www.hyperphysics.com
2) www.physicsinfo.com http://nptel.ac.in/course.php?disciplineId=115
3) http://nptel.ac.in/course.php?disciplineId=104
4) http://hperphysics.phy-astr.gsu.edu/hbase/hph.html
5) www.physicsclassroom.com
6) www.physics.org
7) www.fearofphysics.com
8) www.sciencejoywagon.com/physicszone
9) www.science.howstuffworks.com
10) www.in.wikipedia.org
11) www.nptel.iitm.ac.in
12) www.chem1.com
13) www.onlinelibrary.wiley.com
14) www.rsc.org
15) www.chemcollective.org
16) www.science.howstuffworks.com
17) www.in.wikipedia.org
18) www.nptel.iitm.ac.in
19) www.physicsclassroom.com

K) CO-PO Matrix –

CO's	PO1 Basic knowledge Discipline specific knowledge	PO2 Problem analysis	PO3 Design/ development of solutions	PO4 Engineering Tools, Experimentation and testing	PO5 Engineering practices for society, sustainability & environment	PO6 Project Management	PO7 Lifelong learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	-	-	1	1	1	1	-	-	-
CO2	3	-	-	1	1	1	1	-	-	-
CO3	3	-	-	1	1	1	1	-	-	-
CO4	1	-	-	-	2	-	1	-	-	-
CO5	2	-	-	1	2	1	1	-	-	-
CO6	2	1	1	1	2	1	1	--	-	-

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Communication Skills (English)
Course code	R23CP1702
Course Category	AEC
Credits	03

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	06	03	03	30	70	100	40	25 @	10 @	-	-	25 @	10@	**150**

ABBREVIATIONS:
Legends: @ Internal, # External, *# Online Examination , @$ Internal Online Examination
Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA- Formative Assessment, SA-Summative Assessment, IKS: Indian Knowledge System, SLA- Self Learning Assessment.

A) RATIONALE:

English is used in all spheres of life. Competency in English enhances the employability of an engineering professional. In today's competitive world English is important for students in their academics as well as in their prospective career. The students after passing Diploma from any discipline need to use English as a medium of communication in various formal as well as informal situations. They need to be proficient in the four skills of language i.e. listening, speaking, reading and writing. This curriculum is need-based and is designed to help the students to communicate in English effectively.

B) EXPECTED SKILLS

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: Communicate in written and oral form of English effectively at the workplace.

C) COURSE OUTCOMES:

1. Distinguish between various types of communication
2. Communicate effectively by avoiding barriers in various formal and informal situations
3. Comprehend given passages and dialogues.
4. Use relevant words as per context.
5. Deliver effective presentations in English using appropriate body language.
6. Compose and deliver speeches in given formal situations

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Basic Communication Skills** **1.1**Definition, need and importance of communication. **1.2**Communication cycle and elements. **1.3**Encoding and decoding. **1.4**Types of communication. **1.5**Distinguish between different types of communication.	1.1 Define communication. 1.2 State the importance of communication in business. 1.3 Enlist elements of communication. 1.4 Explain the various elements of communication. 1.5 Identify the different communication elements in a given situation. 1.6 Draw a neat sketch of the communication cycle for a given situation. 1.7 Explain encoding and decoding. List types of communication 1.8 Identify the type of communication in a given situation. 1.9 Distinguish between verbal and non- verbal communication. 1.10 Distinguish between oral and written communication. 1.11 Distinguish between formal and informal communication. 1.12 Communicate effectively in a given formal and informal situation.	**08**	**10**	**CO1**
2	**Effective Communication** **2.1**Barriers in communication. Mechanical Physical Psychological [Prejudice, status block, negative emotions like fear, ego, low confidence]Linguistic Cultural. **2.2** Overcoming barriers **2.3** Principles of communication Clarity Conciseness Correctness Completeness Feedback Informality Media selection Flexibility. **2.4** Technical objects : Heading Description of technical objects. **2.5** Picture Description: Situational picture Describe in your own words. **2.6** Diary Entry : writer Date C.	2.1 Define "barriers in communication". 2.2 List types of barriers in communication. 2.3 Explain mechanical, physical, psychological, linguistic, and cultural barriers with suitable examples. 2.4 Identify the communication barriers in a given situation. 2.5 Suggest remedies to overcome the given barriers. 2.6 List principles of effective communication. 2.7 Describe the various principles of communication with suitable examples. 2.8 Apply the various principles in oral and written communication. 2.9 Describe the given technical objects with specifications. 2.10Explain the picture in grammatically correct language.	**08**	**15**	**CO2**

		2.11 Diary entry on situations.			
3	**Reading Comprehension** **3.1**Comprehension based on dialogues **3.2**Comprehension based on passage.	3.1 Answer the questions on a given unseen passage/ dialogue. 3.2 Answer the questions orally on the given unseen passage with correct pronunciation.	**06**	**10**	**CO3**
4	**Vocabulary Building** **4.1**Phonetic transcription (IPA) **4.2**Use of dictionary: Dictionary entry, Phonetic transcription, contextual meaning, Forms of verbs, Parts of speech. **4.3** Homophones **4.4**Collocations **4.5**Synonyms and Antonyms **4.6** Prefix and Suffix.	4.1 Write transcriptions of simple English words correctly. 4.2 Pronounce the given words correctly using the given transcriptions. 4.3 State difference between the given homophones (difference in pronunciation and meaning) 4.4 State a word that is pronounced in a similar way as the given word. 4.5 State the meaning of the commonly used collocations 4.6 Frame a meaningful sentence using the commonly used collocations. 4.7 State the synonyms and antonyms of commonly used English words. 4.8 Identify base, prefix, and/or suffix of a given word. Make a list of meaningful words using different prefixes and suffixes	**08**	**15**	**CO4**
5	**Presentation Skills** **5.1**Need and importance **5.2**Effective presentations: Preparation, structure of presentation, personal grooming, audience awareness, non verbal communication, use of stories, anecdotes etc., voice modulation, time and stress management. **5.3**Body Language: Facial expression, gesture, vocalic.[paralanguage] **5.4**Effective use of Power point slides and other advanced tools for presentations.	5.1 State the need and importance of presentation skills in a professional career. 5.2 State the meaning of effective presentation skills. 5.3 Explain the points to be considered for effective presentation. 5.4 State the different positive and negative body language cues and its effects on the audience. 5.5 Prepare a presentation using PowerPoint or other similar platforms.	**08**	**10**	**CO4**
6	**Public Speaking** **6.1**Importance of public speaking **6.2**Characteristics of a good speech **6.3**Self introduction in formal situations	6.1State importance of public speaking 6.2 State features of a good formal speech 6.3 State characteristics of a good	**07**	**10**	**CO5**

	6.4 Introducing a guest **6.5**Farewell speech **6.6** Vote of thanks.	vote of thanks speech 6.4 Write a vote of thanks speech for the given situation. 6.5 State characteristics of a good farewell speech 6.6 Write a farewell speech for the given situation. 6.7 State characteristics of a good speech for introducing a guest 6.8 Write a speech for introducing a guest in the given situation. 6.9 Deliver a speech on a given situation			

E) PRACTICAL (BASED ON LL & TL) ASSESSMENT WORK

Sr. No.	CO	Practical Exercises (Outcomes in Psychomotor Domain)	Language Skills required			
			Listen	Speak	Read	Write
1	CO1	Identify different elements of communication in a given situation. Mark the elements on a communication cycle diagram.			✓	✓
2	CO1	Select a classroom situation and identify the various elements in it.			✓	✓
3	CO2	Describe any three technical objects using correct grammar.			✓	✓
4	CO2	Describe the given picture with reference to elements like colors, shapes and other visual aids.			✓	✓
5	CO3	Read a story and answer the questions orally using correct grammar and pronunciation.		✓	✓	
6	CO3	Read a given passage and answer the questions orally using correct grammar and pronunciation.		✓	✓	
7	CO3	Listen to a podcast / talk in English and answer the questions orally using correct pronunciation.	✓	✓		
8	CO4	Identify at least 10 words from a story / a paragraph / a news article and write their synonyms, antonyms, and homophones.			✓	✓
9	CO4	Write the meanings and example sentences of at least 10 collocations. Make use of a standard dictionary to write the assignment.			✓	✓
10	CO4	Write 20 words using phonetic transcription (IPA) and pronounce them correctly. Learn pronunciation with the help of audio pronunciation available on standard dictionary websites (suggested: Oxford, Cambridge)	✓	✓		✓

11	CO4	Identify 5 difficult words from a story / a paragraph / a news article. Write the phonetic transcription, meaning, one example sentence each.			✓	✓
12	CO4	Identify 5 words with prefixes and 5 words with suffixes from a story / passage / news article. Write the words and their meanings.			✓	✓
13	CO5	Introduce yourself in front of your class/batch.	✓	✓		
14	CO5	Introduce your best friend to your new classmates.	✓	✓		
15	CO5	Give a presentation on a given topic.	✓	✓		
16	CO6	Write a speech on the given situation.				✓
17	CO6	Deliver a speech on the given situation.		✓		
18	CO6	Listen to a formal speech and write the summary in 150 words.	✓			✓
Note: Any **12 out of 18** assignments are compulsory. At least one assignment is compulsory on each CO.						

F) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) [Any One]

1. Conduct a quiz on vocabulary in small groups.
2. Make a video of the biography of a social worker / Indian freedom fighter or any other appropriate topic given by the teacher.
3. Make a video on famous places in town.
4. Summarize the editorial columns of a Standard English newspaper.
5. Summarize the contents of a famous book/TV show/documentary film.
6. Prepare a booklet on the contribution of eminent Indian scientists.
7. Prepare a questionnaire and conduct an interview of industry personnel, social worker or an entrepreneur.
8. Role play.
9. Narrate a story.
10. Poster presentation.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED

- Language laboratory with latest software
- LCD –Projector
- Smart Board
- **SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE: (Specification Table)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Basic Communication Skills	08	2	2	6	10
2	Effective Communication	08	4	4	7	15
3	Reading Comprehension	06	2	4	4	10
4	Vocabulary Building	08	4	4	7	15

5	Presentation Skills	08	2	4	4	10
6	Public Speaking	07	2	4	4	10
	Total	**45**	**16**	**22**	**32**	**70**

H) ASSESSMENT TOOL

- Formative assessment
1. FA-TH (Two Unit Tests of 30 marks each)
2. FA-PR (Term-work)
- Summative Assessment
1. SA-TH (Term-end exam of 70 marks)

I) LEARNING RESOURCES

- **Books**

Sr. No.	Title of Book	Author	Publication
1	English Grammar at a Glance	Gnanamurli	S.Chand
2	Communication Skills in English	Dr.Anjana Tiwari	Khanna Publishers, New Delhi
3	Effective English with CD	Kumar,E.Suresh,Sreehari, P Savitri	Pearson Education
4	Essential Grammar in Use	Raymond Murphy	Cambridge University Press Fourth edition
5	Essential English Grammar	Raymond Murphy	Cambridge University Press
6	Intermediate English Grammar	Raymond Murphy	Cambridge University Press
7	Advanced English Grammar	Raymond Murphy	Cambridge University Press
8	Living English Structure	Allen, W.S.	Pearson Education, New Delhi, Fifth edition, 2009, ISBN:108131728498,99
9	English Reading Comprehension	R. Gupta	Ramesh Publishing House, New Delhi
10	The Art of Public Speaking	Dale Carnegie	Ocean Paperbacks
11	Word Power Made Easy	Norman Lewis	Pocket Books / Goyal Publishers & Distributors
12	Essential Communication Skills	Shalini Aggrarwal	Ane Books Pvt Ltd
13	Presentation Skills: The Essential Guide for Students.	Patsy McCarthy & Caroline Hatcher	Sage Publications New Delhi

- **SOFTWARES/TOOLS/MODELS**
  - Latest online resources, apps etc.
  - Language laboratory resources.

J) WEBSITES LINKS

1. https://www.britishcouncil.in/english/online
2. https://learnenglish.britishcouncil.org/english-levels/online-english-level-test
3. https://www.talkenglish.com/
4. https://www.learn4good.com/
5. https://fluentzy.com/
6. www.edufind.com/
7. https://owl.purdue.edu/
8. https://www.vocabulary.com/

9. https://www.esl-lounge.com/student/grammar-guides/grammar-advanced.php
10. https://www.elllo.org/
11. https://www.esl-lab.com/

K) CO-PO-PSO MATRIX

Course Outcomes	PO 1 Basic & discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools	PO 5 Engineering practice for society, sustainability and environment.	PO 6 Project management	PO7 Lifelong learning	PSO 1	PSO 2	PSO3
CO1	-	1	1	-	-	1	-	-	-	2
CO2	-	1	1	-	-	1	-	-	-	2
CO3	-	1	-	-	1	1	1	-	-	2
CO4	-	1	-	-	1	1	1	-	-	2
CO5	-	-	-	-	1	1	-	-	-	3
CO6	-	-	-	-	1	1	-	-	-	3

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Engineering Graphics' Skills
Course Code	R23CP2201
Course Category	DSC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2		2	-	4	2	-	-	-	-	-	25	10	50@	20	-	-	75

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Engineering graphics which is known as the language of engineers is widely used means of communication among the designers, engineers, technicians & craftsmen in an industry. The translation of ideas into practice without the use of this graphical language is really beyond imagination. This course helps in developing drafting and sketching skills amongst the students. Thus for the effective & efficient communication among all involved in an industrial system, it becomes necessary for a diploma engineer to acquire the skills to read, draw and interpret various drawings. This preliminary course aims at building a foundation for the further courses in drawing and other allied courses.

B) EXPECTED SKILL/s –

1. Reading and interpreting of drawings and components.
2. Use of various drawing instruments such as mini drafter, set square etc.
3. Improve drafting skills.

C) COURSE OUTCOMES (COs)

1. Understand the use of various drawing instruments and redraw the given figures.
2. Draw engineering curves with different methods.
3. Draw orthographic projections of the given object.

4. Construct an isometric view from the given views.
5. Draw the sectional views for given object.
6. Distinguish mechanical components for various applications/products through freehand sketches.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs. / Week	FA-TH MAX.	CO Mapped
UNIT NO.1 Geometrical construction & Tangent exercises , Redraw Figures	**1.1** Use of instruments, types of lines, types of letterings, full, enlarging and reducing scales, dimensioning technique as per SP-46 (Latest edition). **1.2** Standard sizes of drawing sheets (ISO-A series) **1.3** I.S codes for planning and layout. **1.4 Geometrical constructions**: - To construct a regular polygon of given side. - To construct a regular polygon in a given circle. - To inscribe a circle in a given polygon. - To circumscribe a circle around a given polygon. - To draw circles touching each other and sides of a given polygon internally & externally. **1.5 Tangent exercises :-** - To bisect a given straight line/ arc /angle. - To divide a given straight line into given number of equal parts. - To draw a normal to a given straight line/ arc from a given point within or outside it. -To draw a straight line parallel to a given straight line /arc through point/ at a given distance. -To draw an arc touching to two straight lines / two arcs (internally/ externally)/ one line & an arc. - To draw an internal/ external tangent to two given arcs apart from each other.	1. Explain elements of engineering graphics. 2. Draw various types of geometrical constructions in Engineering Graphics. 3. Draw various types of tangent exercises in Engineering Graphics. 4. Redraw figures by using geometrical constructions & tangent exercise.	**4**		**CO1**

	1.6 Redraw figures: - To redraw the given figures (using the knowledge of Geometrical constructions & Tangent Exercises).				
UNIT NO.2 Engineering Curves	**2.1** To study the construction of following curves using the method mentioned against them: Ellipse - Directrix focus method & concentric circles method. Parabola- Directrix focus method, rectangle method.	1. Draw Conic curves, & know Their applications.	**4**		**C02**
UNIT NO.3 Orthographic Projections	**3.1** Introduction of projections – orthographic, perspective, isometric and oblique: concept and applications. **3.2** Introduction to orthographic projection, first angle and third angle method, their symbols. Conversion of pictorial view into orthographic views – object containing plain surfaces, slanting surfaces, slots ,ribs, cylindrical surfaces .(by using first angle method & Third angle method of projection)	1. Visualize, interpret & draw orthographic views from given pictorial view. 2. Draw Orthographic Projections by first & third angle	**6**		**C03**
UNIT NO.4 Isometric projection &Views	**4.1** Construction & use of Isometric Scale and Natural Scale. **4.2** Conversion of given orthographic views into isometric projections/views (objects including curves, slots on sloping planes).	1. Differentiate natural scale and isometric scale. 2. Visualize, interpret & draw isometric view and isometric projection.	**6**		**CO4**
UNIT NO.5 Sectional Views	**5.1** Conversion of given pictorial views into sectional (full sectional) orthographic projections using first angle & third angle method of projections. Dimensioning the views.	1. Visualize, interpret & draw sectional views from given pictorial view	**5**		**CO5**
UNIT NO.6 Free Hand Sketches of Engineering Elements	**6.1** Threads and thread profiles. Conventional representation of threads. Types of nuts, bolts, studs, set screws washers, locking arrangements,	1. Explain and Draw Fasteners, Nuts, Bolts, Set screws and know their applications.	**5**		**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required	Relevant COs
1	Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75degrees lines using Tee and Set squares/ drafter (Sketch Book).	1	CO1
1	Draw different types of lines, dimensioning styles.(Sketch Book)	1	CO1
1	Draw Four problems on Geometrical construction. (Sketchbook)	2	CO1
1	Draw four problems on Geometrical construction. (01sheet)	2	CO1
1	Draw four problems on redraw the figures. (sketchbook)	2	CO1
1	Draw four problems on redraw the figures. (01 sheet)	2	CO1
2	Draw different types of Engineering Curves.(Sketchbook)	2	CO2
2	Draw different types of Engineering Curves.(01 sheet)	2	CO2
3	Draw four problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc. -(Sketchbook)	2	CO3
3	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc. -(01Sheet)	2	CO3
3	Draw four problems on orthographic projections using third angle method of projection having cylindrical surfaces, ribs etc.(Sketch book)	2	CO3
3	Draw four problems on orthographic projections using third angle method of projection having cylindrical surfaces, ribs etc.(Sketch book)(01Sheet)	2	CO3
4	Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale.(Sketch book)	2	CO4
4	DrawtwoproblemsonIsometricviewofsimpleobjectshavingplainandslantingsurfacesbyusingnaturalscale. (01 sheet)	2	CO4
6	Draw free hand Sketches of different standard components (Sketchbook)	2	C06
6	Draw free hand Sketches of different standard components ((01Sheet)	2	CO6
6	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics.	2	CO1, CO2, CO3, CO4, CO5, CO6
Total		**32**	

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES)

- Not applicable

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment Name With Broad Specifications	Relevant LLO No.
1	Drawing Table with Drawing Board of Full Imperial /A1size.	All
2	Mini drafter, Set squares, compass, pencils, eraser, drawing clips etc.	All

3	Solid models of objects for orthographic/ isometric projection/ free hand sketches	9, 10, 11, 12, 13, 14, 15, 16
4	Solid Models/Charts of objects	17

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

I) ASSESMENT TOOL –

1) **Formative assessment**
   - Term work
2) **Summative Assessment**
   - Practical

J) LEARNING RESOURCES –

- **BOOKS**

SR. NO.	AUTHOR	TITLE	PUBLISHER
1.	N.D. Bhatt	Engineering Drawing	Charotar Publication, Anand.
2.	Mali and Chaudhary	Engineering Drawing	Vrinda Publications, Jalgaon.
3.	Kamat & Rao	Engineering Drawing	Jeevandeep Publicatons, Mumbai
4.	N.Y. Prabhu	Geometrical Engineering Drawing	Pune Vidyarthi Griha, Publications, Pune.
5.	Ozarkar& Utturkar	Engineering Drawing	Maharashtra Publishing House
6.	K. Venugopal	Engineering Drawing	New Age International Ltd., Delhi.
7.	SP 46-1988	Code of practice for general engineering drawing	Bureau of Indian Standards.(BIS)

- **SOFTWARE/ TOOLS/ MODELS**

  Wooden blocks

- **WEBSITES LINKS**

Sr. No.	Link/portal	Description
1	https://www.youtube.com/watch?v=fvjk7PlxAuo https://www.youtube.com/watch?v=3WXPanCq9LI https://www.youtube.com/watch?v=auEGg7h5keI	Geometrical construction & tangent exercises and redraw

	https://www.youtube.com/watch?v=Z6j17LvbGcw	
2	https://www.youtube.com/watch?v=xHm7hB2iBgI https://www.youtube.com/watch?v=EhIyC9Xty6w https://www.youtube.com/watch?v=jc8T5MkEDQs	Engineering curves
3	https://www.youtube.com/watch?v=9KJqy9PIJ50 https://www.youtube.com/watch?v=j5nwO-JwVv4&list=PLDN15nk5uLiBpnIOK5r3KXdfFOVzGHJSt https://www.youtube.com/watch?v=dU1hw53azmk	Orthographic projection
4	https://www.youtube.com/watch?v=8j7l1OWhMlE https://www.youtube.com/watch?v=JxyYcbLgSgM https://www.youtube.com/watch?v=66R4esOwuAg https://www.youtube.com/watch?v=vyFFwhWi5Ig	Isometric view and isometric projection
5	https://www.youtube.com/watch?v=K_2uJPkCv0Y https://www.youtube.com/watch?v=WVhqUH4VD20 https://www.youtube.com/watch?v=belZlq0ExQU	Sectional view
6	https://www.youtube.com/watch?v=Jzr5PTbvkVI https://www.youtube.com/watch?v=VVHVTOffD6s https://www.youtube.com/watch?v=y6DnJ0HEmCI	Free hand sketches

K) CO-PO Matrix –

CO's	PO1 Basic knowledge Discipline specific knowledge	PO2 Problem analysis	PO3 Design/ development of solutions	PO4 Engineering Tools, Experimentation and testing	PO5 Engineering practices for society, sustainability & environment	PO6 Project Management	PO7 Lifelong learning	PSO1	PSO2	PSO3
CO1	3	1	-	1	1	-	1	-	-	1
CO2	3	2	-	1	1	-	1	-	-	1
CO3	3	2	1	1	1	-	1	-	-	1
CO4	3	2	1	1	1	-	1	-	-	1
CO5	3	2	1	1	1	-	1	-	-	1
CO6	2	2	1	-	1	1	2	1	-	2

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	ENGINEERING WORKSHOP PRACTICE
Course code	R23CP6401
Course Category	Skill Enhancement Course (SEC)
Credits	02

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs. / Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
							FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	4	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	100

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

E) RATIONALE
A professional in his/her life works in a typical business environment where s/he interacts with computers, peripherals and related devices and instruments. Personal computer, like any other equipment, needs proper maintenance to perform at its best. They must be able to use and maintain this equipment's authentically. They must also possess basic skills of assembling desktop computers, interfacing with peripheral devices, installing new devices and carry out basic preventive and breakdown maintenance. Hence, this course is designed to develop these Knowledge and vital skills in them through various workshop-based activities.

F) INDUSTRY / EMPLOYER EXPECTED OUTCOME–
The aim of this course is to help the student to perform simple maintenance operations on computer system, its peripherals and network.

G) COURSE OUTCOMES (COs)
Students will be able to

CO1 - Carry-out elementary level maintenance of a PC.
CO2 - Create partitions and format hard disk drive.
CO3 - Install and configure Operating system.
CO4 - Configure different types of peripheral devices.
CO5 - Setup a small Local Area Network.
CO6 - Use diagnostic software for fault finding in Computer system.

H) COURSE CONTENT -

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I) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK–

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of hrs.	Relevant COs
1	Desktop/laptop/server type identification and its specification	LLO 1.1 Identify desktop/laptop by its type and verify its specifications LLO 1.2 Identify type of server and verify its Specification	2	CO1
2	Identification and cleaning of Components	LLO 2.1 Open PC Panel and Identify Components LLO 2.2 Clean inside PC - Boards and Slots	4	CO1
3	Preventive Maintenance of PC	LLO 3.1 Undertake Preventive Maintenance of PC using vacuum cleaner and simple tools	2	CO1
4	Perform Internal socket connections	LLO 4.1 Connect/disconnect power socket and controller socket to disk drives and motherboard.	2	CO1
5	Perform BIOS settings	LLO 5.1 Configure different BIOS settings in computer system	2	CO1
6	Manage a Hard disk	LLO 6.1 Partition and manage hard disk LLO 6.2 Format hard drives with different file systems.	2	CO2
7	Installation of Windows Operating System	LLO 7.1 Install Operating System – Windows family (such as Windows 10, 11)	2	CO3
8	Installation of Unix family Operating System	LLO 8.1 Install Operating System – Unix family(such as Linux/ Ubuntu / Centos)	2	CO3
9	Peripheral devices cleaning	LLO 9.1 Clean peripheral devices and connect it to computer	4	CO4
10	Installation of local and Network printer	LLO 10.1 Install local printer by applying various types of configuration settings LLO 10.2 Remove and mount cartridge, troubleshoot paper jam	2	CO4

11	Share devices, files and folders	LLO 11.1 Share the printer, devices, folders on a network	4	CO4
12	Installation of scanner	LLO 12.1 Install and configure scanner	2	CO4
13	Set Input/output devices	LLO 13.1 Set and configure monitor/display, Speaker, Microphone and LCD Projector	2	CO4
14	Make CAT5, CAT6 Cable	LLO 14.1 Prepare and test crossover and straight cable, CAT5, CAT6 Cable, using connector, crimping tools, splicer	2	CO5
15	Connect devices to external port	LLO 15.1 Connect/disconnect LAN Cable, External Hard disk, Modem, LCD/DLP Projector	2	CO5
16	Networking devices connection	LLO 16.1 Connect Modem, Hub/Switches/routers and verify the connection	2	CO5
17	Fiber optic cable construction	LLO 17.1 Check different types of fiber optic cables construction and connectivity	2	CO5
18	Connection of Switches/Hubs	LLO 18.1 Connect two Switches/Hubs using normal and uplink port	2	CO5
19	Setup Wi-Fi environment	LLO 19.1 Configure devices to setup Wi-Fi environment	2	CO5
20	Setup wired network environment	LLO 20.1 Create a small wired network environment	4	CO5
21	Setup wireless I/O devices	LLO 21.1 Set and configure blue tooth based wireless mouse, keyboard and other devices	2	CO5
22	Fault diagnostics	LLO 22.1 Use diagnostic software for PC faultfinding	4	CO6
23	Anti-viruses installation	LLO 23.1 Install Antivirus and Configure various settings	2	CO6
24	Component replacement	LLO 24.1 Replace internal components of PC	4	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES)

Assignment

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Micro project

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G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary components like: motherboard, random access memory (RAM),read-only memory (ROM), Graphics cards, soundcards, internal hard disk drives, DVD drive, network interface card	1,2,3,4,5,6,7,8,9,10,11,12,13,14, 15,16,17,18,19,20,21,22
2	LCD/DLP Projector(Epson EB-X49 XGA Projector Brightness: 3600lm with HDMI Port (Optional Wi-Fi).	15
3	Modems, hubs, switches, Router	16
4	Wi-Fi set-up with access point and repeater	19
5	Bluetooth based wireless mouse and keyboard or any other device	21
6	Cat5/Cat6 cable, with RJ 45 Connectors, LAN tester	14
7	Fiber optic cable with SC, ST, LC Connectors	17
8	Laser Printer	10,11
9	Scanner	12
10	Hub/Switches/Routers	18
11	Fault finding software, antivirus	22,23
12	Operating System, Hard Disk	6,8
13	Computer Maintenance kit	2,3,4,5,6,7,8,9,10,11,12,13,14,1 5,16,17,18,19,20,21,22
14	External Hard Disk(500 GB/1 TB)	15
15	Light vacuum cleaner, approx. 200 watts with brushes and accessories	2,3,9

H) SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE(Specification Table): NOT APPLICABLE

I) ASSESMENT TOOL –

1) **Formative assessment (Assessment for Learning)**
   Rubrics for COs, Terms work, Presentation
2) **Summative Assessment (Assessment of Learning)**
   End of Term Examination (Lab. performance), Viva-voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Author	Title	Publisher
1	James, K.L.	The computer hardware installation, interfacing, troubleshooting and maintenance	PHI Learning, New Delhi, 2014ISBN: 978-81-203-4798-4
2	Minasi, Mark	The Complete PC Upgrade And maintenance Guide	BPB Publication, New DelhiISBN:978-81-265-0627-

			9
3	Kadam, Sachin	Computer Architecture and Maintenance Vol.1	Shroff Publication, MumbaiISBN: 978-9350230244
4	Craig Zacker,John Rourke	The Complete Reference PC Hardware	Mc Graw Hill Education ISBN-13:978-0070436060

- **WEBSITES LINKS**

Sr.No	Link / Portal	Description
1	http://www.ciscopress.com/articles/article.asp?p=2086239&seqNum=4Essential Introduction to Computer	Reading material about computer Lab Procedure and tool use
2	http://www.instructables.com/id/Computer-Assembly/	Reading material about Computer assembly
3	http://www.liutilities.com/how-to/operate-a-laptop-computer/	Article about How To Operate a Laptop Computer
4	https://video.search.yahoo.com/search/video?fr=mcafee&ei=UTF-8&p=hardware+maintenance+and+troublesho	Video about Trouble Shooting of Computer
5	geeksforgeeks.org/how-to-set-up-a-LAN-network	Reading material about Process to set a LAN
6	https://www.youtube.com/watch?v=cc2fyg-B5WE	Video about setting a LAN
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

K) CO-PO-PSO Matrix –

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design / Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO1	PSO2	PSO3
CO1	2	2	-	2	-	-	1	3	-	2
CO2	2	2	-	2	-	-	1	3	-	2
CO3	2	2	-	2	-	-	2	3	-	2
CO4	2	2	-	2	-	-	1	3	-	2
CO5	2	3	1	2	-	1	1	3	-	2
CO6	2	3	-	3	-	-	2	3	-	2

Legends: - High: 03, Medium: 02, Low: 01

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer
Course Name	Fundamentals of ICT
Course code	R23CP6402 / R23CI6602
Course Category	Skill Enhancement Course (SEC)
Credits	03

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	2	6	3	-	-	-	-	-	50	20	25@	10	25	10	100

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

A) RATIONALE-
The application domain of computer depends totally on human creativity and imagination; it covers the wide range of applications including education, industries, government, medicine, scientific, research, law, music and arts. This subject contains the fundamentals of computer systems focusing on various hardware, storage devices, software components, and concept of operating system, network and its types along with of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain. The student needs to learn various software such as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project report, presentations, perform data analysis and its graphical representations. This subject prepares foundation for the study of other courses

B) INDUSTRY / EMPLOYER EXPECTED OUTCOME–
The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies. in different domain.

C) COURSE OUTCOMES (COs)

Students will be able to –

CO1: Understand the working of a computer system, storage devices, and their peripherals.
CO2: Explain the concepts and types of operating systems and use application software.
CO3: Use word processing tools to prepare and format documents.
CO4: Use spreadsheets to analyze data and represent it graphically.
CO5: Create effective presentations using PowerPoint.
CO6: Use DOS commands, web browsers, and Internet services, and understand the concepts and applications of emerging technologies.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	Suggested Learning Pedagogies
1	**Unit - I Introduction to Computer System** **1.1 Basics of Computer** System: Overview of Hardware and Software: block diagram of Computer System, Input/output unit CPU, Control Unit, Arithmetic logic Unit(ALU), Memory Unit **1.2 Internal components:** processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives **1.3 External Devices**: Types of input/output devices, types of monitors, keyboards **Pointing Devices**- Mouse (Mechanical and Optical), Joystick, and Touch screen (Introduction). **Printers**: Dot matrix, Inkjet and LaserJet, plotter and **Scanning Devices** – Handheld, Flatbed, Drum, Slide Scanner, Sheet fed scanner **External storage devices** CD/DVD, Hard disk and pen drive **Optical Recognition Devices** – OCR Devices, OMR Devices, MICR Devices, Bar code reader. **Introduction to -**Digital Camera, Voice Recognition System. **Media Input Devices-**Microphone, Webcam, Graphics tablet	TLO 1.1 Explain the functions of components in the block diagram of computer system. TLO 1.2 Understand and describe the different types of input devices. TLO 1.3Understand and describe the different types of output devices.	**5**	Hands-on Demonstration Presentations
2	**Unit II** **2.1 Computer Software and Operating Systems**	TLO 2.1 Classify the given types of software TLO 2.2 Understand the	**5**	Hands-on Demonstration Presentations

	Introduction, types of Computer software- System Software, Application Software. System Development Programs – Language Translators (Assembler, Compiler, Interpreter), Linkers, Debuggers, Editors, device drivers. Introduction, Functions of Operating System (Introduction) – Process Management, Memory Management, File management, Device Management, Security Management **2.2 Application Software**: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software **2.3 Exposure to Windows OS:** Introduction, Desktop (taskbar, customising taskbar, desktop, customising desktop), My Computer, My Documents, My Network Places, Recycle Bin, Windows Explorer. Files and Folders- creation, moving, copying, renaming, deleting, searching.	components of Windows O.S TLO 2.3 Describe procedure to manage a file /folder in the given way		
3	**Unit - III Word Processing** **3.1 Word Processing:** Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application. **3.2 Editing a Document:** Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting **3.3 Changing the Layout of a Document:** Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs **3.4 Inserting Elements to Word Documents:** Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture	TLO 3.1 Write steps to create the given text document. TLO 3.2 Explain the given feature for document editing. TLO 3.3 Explain the given page setup features of a document. TLO 3.4 Write the given table formatting feature. TLO 3.5 Write the steps to set the given type of document layout	**5**	Hands-on Demonstration Presentations

	3.5 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page **3.6 Working with Columned Layouts and Section Breaks:** a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust			
4	**Unit - IV Spreadsheets** **4.1 Working with Spreadsheets:** Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. **4.2 Editing Worksheet:** Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze **4.3 Formatting Cells and sheet:** Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks. **4.4 Working with Formula:** Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF. **4.5 Working with Charts:** Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. **4.6 Advanced Operations:** Conditional Formatting, Data Filtering, Data	TLO 4.1 Write steps to create the given spreadsheet. TLO 4.2 Explain the given formatting feature of a worksheet. TLO 4.3 Write steps to insert formula and functions in the given worksheet. TLO 4.4 Write steps to create charts for the given data set. TLO 4.5 Explain steps to perform data filter, sort and validation operations on the given data set. TLO 4.6 Write steps to setup and print a spreadsheet.	**5**	Hands-on Demonstration Presentations

	Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.			
5	**Unit - V Presentation Tool** **5.1 Creating a Presentation:** Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, and View a Prese. **5.2 Inserting Media elements**: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format **5.3 Working with Tables**: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. **5.4 Working with Charts:** Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.	TLO 5.1 Write the steps to create the given slide presentation. TLO 5.2 Write the steps to insert multiple media in the given presentation. TLO 5.3 Explain the method of including animation, transition effects in slide show. TLO 5.4 Write steps to apply table features in the given presentation TLO 5.5 Write steps to manage charts in the given presentation	**4**	Hands-on Demonstration Presentations
6	**Unit - VI Basics of DOS, Network , Internet and Emerging Technologies** **6.1 MS-DOS :** Introduction, Internal commands – dir, mkdir(md), rmdir(rd), chdir(cd), type, copy, del, cls ,date, time. External commands - attrib, edit, tree, chkdsk, and help. **6.2Network environments:** network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth, topology, Use of computer nodes (Client Server Networks, Peer-to-peer Networks). Network Topologies – Introduction, Types hierarchical, bus, star, ring, mesh, and hybrid. **6.3 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	TLO 6.1 Understand and run the MS-DOS commands. TLO 6.2 Understand the concept of computer networks, types and network topologies. TLO 6.3 Explain use of the given setting option in browsers. TLO 6.4 Explain the given option used for effective searching in search engine TLO 6.5 Explain features of the given web service. TLO 6.6 Explain concepts and applications of emerging technologies TLO 6.7 Use various elementary cloud-based tools.	**6**	Hands-on Demonstration Presentations

	bookmarks, use search engines effectively for **6.4 Web Services**: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking **6.5 Emerging Technologies:** IOT, AI and ML, Drone Technologies, 3D Printing. **6.6 Tools:** Docs, Drive, forms, quiz, Translate and other Apps			

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs	Relevant CO's.
1.	*a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders.	LLO 1.1 Identify various Input / Output devices, connections and peripherals of computer system LLO 1.2 Work with Computer System, Input/output devices, and peripherals for manages files and folders for data storage.	2	CO1
2.	*Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting	LLO 2.1 Create and manage word document. LLO 2.2 Apply formatting features on text at line, paragraph and page level.	2	CO2
3.	Work with Images and Shapes in Word Processing.	LLO 3.1 Insert and edit images, shapes in a document file	1	CO2
4.	*Work with tables in Word Processing.	LLO 4.1 Insert table and apply various table formatting features on it.	2	CO2
5.	*Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	LLO 5.1 Apply page layout features in word processing. LLO 5.2 Print a document by applying various print options LLO 5.3 Use mail merge in word processing	2	CO2
6.	*Create, open and edit Worksheet.	LLO 6.1 Enter and format data in a worksheet. LLO 6.2 Insert and delete cells, rows and columns LLO 6.3 Apply alignment feature on cell	2	CO3
7.	*Formulas and functions in Worksheet.	LLO 7.1 Create formula and "If" condition on cell data	2	CO3

		LLO 7.2 Apply various functions and named ranges in worksheet.		
8.	*Sort, Filter and validate data in Spreadsheet	LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	2	CO3
9.	*Charts for Visual Presentation in Spreadsheet.	LLO 9.1 Create charts using various chart options in spreadsheet.	2	CO3
10.	Worksheet Printing.	LLO 10.1 Print the worksheet by applying various print options for worksheet	1	CO3
11.	*Make Slide Show Presentation.	LLO 11.1 Apply design themes to the given presentation LLO 11.2 Insert pictures text/images/shapes in slide LLO 11.3 Use pictures text/images/shapes editing options.	2	CO4
12.	*Use Tables and Charts in Slide	LLO 12.1 Add tables and charts in the slides. LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes	2	CO4
13.	*a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation	LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation.	2	CO4
14.	a) Internet connection configuration b) Use Internet and Web Services.	LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on internet	1	CO6
15.	Working with Browsers.	LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose	1	CO6
16.	*Introduction to DOS and use of internal and external Commands	LLO 16.1 Use Internal and External commands for different operations.	2	CO6
17.	*Prepare Web Forms for Survey.	LLO 17.1 Create web forms for survey using different options.	1	CO6
18.	*Prepare Web Forms for Quiz	LLO 18.1 Create web forms for Quiz using different options	1	CO6

Note : Out of above suggestive LLOs -

- '*' Marked Practical's (**Practical Titles**) are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs is to be performed to achieve desired outcomes.

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Self Learning

Following are some suggestive self-learning topics:

- Use Note-taking Apps for Organization (to take digital notes (OneNote, Evernote, Google Keep)
- Use ChatGPT/any other AI tool to explore information.
- Use Online Meeting Platforms (Schedule and attend virtual meetings (Zoom, Google Meet))
- Use Calendar to Schedule and edit activities.
- Use Password Managers to Store Credentials. (Set up a secure password vault (e.g., Bitwarden, LastPass)).
- Use Translate app to translate the given content from one language to another.
- Use Online Task Management Tools (Track your tasks and projects using tools like Trello, Asana, or Todoist).
- Use cloud based storage drive to store and share your files.

Micro project

1. The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher.
2. Perform a survey on various inputs and output devices available in market and make its report.
3. Use ChatGPT/AI Tool to Summarize a Technical Research Paper - Choose a real-world technical paper (e.g., Networking, Image Processing, IoT, Machine learning, Artificial Intelligence,) and use ChatGPT to simplify and summarize it. Create Summary document and brief explanation of how the AI helped.
4. Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (Subject teacher shall assign a document to be prepared by each students).
5. Compare Features and Security Options of Popular Cloud Storage Services (Google Drive, OneDrive, Dropbox, iCloud, etc.) – Prepare report consisting of Comparative table report and recommendation for best service for different use-cases (education, business, personal).
6. Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher shall assign a presentation to be prepared by each student).
7. Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student).
8. Survey on Digital Payment Methods Used by Local Businesses – Students should Visit 5–10 shops and collect data on which payment methods they use (UPI, credit card, POS, etc.). Prepare a Survey report with charts and analysis.
9. Carry-out Survey on different web browsers.
10. Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.
11. Create a Digital Marketing Plan for a Small Business (Real or Hypothetical) - Use Canva or any design tool to create digital ads or use any AI tools to generate ad copy.

Deliverable: Summary document + brief explanation of how the AI helped.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a micro project is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Aligned COs	Learning Hours	R - Level	U - Level	A - Level	Total Marks
1	I	Introduction to Computer System	CO1	5	0	0	0	0
2	II	Computer Software and Operating Systems	CO2	5	0	0	0	0
3	III	Word Processing	CO3	5	0	0	0	0
4	IV	Spreadsheets	CO4	5	0	0	0	0
5	V	Presentation Tool	CO5	4	0	0	0	0
6	VI	Basics of DOS, Network , Internet and Emerging Technologies	CO6	6	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

I) ASSESMENT TOOL –

3) **Formative assessment (Assessment for Learning)**
   Lab performance, Assignment, Self-learning and Seminar/Presentation
4) **Summative Assessment (Assessment of Learning)**
   Lab. Performance, viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher
1.	# E.Balgurusamy	Fundamental of Computer	McGrawHill, 1st Edition, 2009
2.	# Itl Education Solution Ltd.	Introduction To Information Technology.	Pearson

3.	Morley & Parker	Fundamental of Computer	Cengage Learning IE, 2008
4.	V. Rajaraman	Fundamentals Of Computers	Eastern Economy Edition, 4th Edition, 2004
5.	D.Ravichandran, A. B. Patil	Computer Fundamentals	TMH pub.
6.	P. K. Sinha	Computer Fundamentals	BPB Publication
7.	Richard Allen King	The MS DOS Handbook	BPB Publication, 2nd Edition

- **WEBSITES LINKS**
  1. http://www.howstufforks.com/
  2. http://www.computerhope.com/msdos.htm
  3. http://office.microsoft.com/
  4. http://www.comptechdoc.org/basic/
  5. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
  6. https://www.javatpoint.com/machine-learning

K) CO-PO Matrix –

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design / Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	-	-	-	-	-	1	2	-	1
CO2	1	-	-	-	-	-	1	2	-	1
CO3	1	-	1	3	-	-	2	-	-	1
CO4	1	1	1	3	-	-	2	-	-	1
CO5	1	-	1	3	-	-	2	-	-	1
CO6	1	1	1	2	-	-	3	1	-	2

Legends :- High:03, Medium:02, Low:01

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Yoga And Meditation
Course code	R23CP4701
Course Category	Value Education Course
Credit	1

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	1	1	2	1	-	-	-	-	-	25	10	-	-	25	10	50

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE
Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice "Yoga" in daily life .

B) INDUSTRY / EMPLOYER EXPECTED OUTCOME
Practice basic Yoga and Pranayama in daily life

C) COURSE LEVEL LEARNING OUTCOMES (COS)
Students will be able to achieve & demonstrate the following COs on completion of course based learning
A) CO1 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
B) CO2 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.

C) CO3 - Follow healthy diet and hygienic practices for maintaining good health.

D) COURSE CONTENT –

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory /Practical Titles	Lab. Learning Outcome	Unit No. / CO	Hrs.
1	Introduction: - Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.	LLO 1.1 Practice warming up for Yoga.	CO1	5
2	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self relaxation.	LLO 2.1 Practice Surya Namaskar	CO1 CO2	7
3	Lab Exp: 4 Perform Sarvangasna,Halasana,Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	LLO 3.1 Practice basic Asanas	CO2	8
4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice KapalbhatiPranayam Kriya Lab Exp:10 Practice BhramaryPranayam.	LLO 4.1 Practice basic pranayama	CO3	5
5	Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	LLO 5.1 Practice meditation	CO3	5

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Micro project

- Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

Assignment

- Prepare Diet and nutrition chart for self

Self Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

G) LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED-

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Yoga and Meditation kits : Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps, Bolsters, Wheels	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE – Not applicable

I) ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Lab performance, Self-learning and Terms work

Summative Assessment (Assessment of Learning)

- Actual Practical Performance

J) LEARNING RESOURCES –

- **BOOKS**

SR. NO.	AUTHOR	PUBLISHER
1.	Swami Vivekananda Patanjalis Yoga Sutras Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017	Luisa Ray, Angus Sutherland Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and meVital Life Books (2022) ISBN-13?: ? 978-1739737009
2.	Swami SaradanandaMudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen yourWatkins Publishing (2019) ISBN-13?: ? 978-1786782786	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSWThe Relaxation and Stress Reduction WorkbookA New Harbinger Self-Help Workbook (2019)

3.	Ann Swanson Science of Yoga: Understand the Anatomy and Physiology to Perfect Your PracticeISBN-13?: ? 978-1465479358	
4.	Swami Vivekananda Patanjalis Yoga Sutras Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017	Luisa Ray, Angus Sutherland Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and meVital Life Books (2022) ISBN-13?: ? 978-1739737009

- **WEBSITES LINKS**

Sr.No	Link / Portal	Description
1	https://onlinecourses.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yoga	Yoga and Applications of Yoga
2	https://onlinecourses.swayam2.ac.in/aic23_ge09/preview	Yoga for Creativity
3	https://onlinecourses.swayam2.ac.in/aic23_ge05/preview	Yoga for concentration
4	https://onlinecourses.swayam2.ac.in/aic23_ge06/preview	yoga for memory development
5	https://onlinecourses.nptel.ac.in/noc21_hs29/preview	Psychology of Stress, Health and Well-being
6	https://onlinecourses.swayam2.ac.in/nce19_sc04/preview	Food Nutrition for Healthy Living - Course – Swayam
7	https://www.classcentral.com/course/swayam-fitness-management-	Fitness Management from Swayam

K) CO-PO-PSO Matrix –

CO's	PO1 Basic knowledge Discipline specific knowledge	PO2 Problem analysis	PO3 Design/ development of solutions	PO4 Engineering Tools, Experimentation and testing	PO5 Engineering practices for society, sustainability & environment	PO6 Project Management	PO7 Lifelong learning	PSO1	PSO2	PSO3
CO1	-	-	-	-	3	-	-	-	-	-
CO2	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-

Legends: - High:03, Medium:02, Low:01

SEMESTER II

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Applied Mathematics
Course code	R23CP1703
Course Category	Ability Enhancement Course
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100

Abbreviations:

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE-

An Applied Mathematics course, covering integration, definite integration, differential equations, numerical methods, and probability distribution, equips engineering students with essential problem-solving tools. It enables them to model and analyze complex systems, make informed decisions and address real-world engineering challenges effectively.

B) EXPECTED SKILL/s –

Engineers applying Mathematics should proficiently solve complex real-world problems, enhancing decision-making, design and innovation with precision and efficiency.

C) COURSE OUTCOMES (COs)-

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Solve the broad-based engineering problems of integration using suitable methods.
CO2 - Use definite integration to solve given engineering related problems.
CO3 - Use probability distributions to solve elementary engineering problems.
CO4 - Apply the concept of differential equation to find the solutions of given engineering problems.
CO5 - Employ numerical methods to solve programmed specific problems.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Unit - I Indefinite Integration** 1.1 Simple Integration: Rules of integration and integration of standard functions 1.2 Integration by substitution. 1.3 Integration by parts. 1.4 Integration by partial fractions (only linear non repeated factors at denominator of proper fraction).	1.1 Solve the given simple problem(s) based on rules of integration. 1.2 Evaluate the given simple integral(s) using substitution method. 1.3 Integrate given simple functions using the integration by parts. 1.4 Solve the given simple integral by partial fractions.	**11**	**15**	**CO1**
2	**Unit - II Definite Integration** 2.1 Definite Integration: Definition, rules of definite integration with simple examples. 2.2 Properties of definite integral (without proof) and simple examples. 2.3 Application of Integration Area under the curve, Mean value	2.1 Solve given examples based on Definite integration. 2.2 Use properties of definite integration to solve given problems. 2.3 Application of Integration Solve problems on area under the curve and mean value.	**11**	**10**	**CO2**
3	**Unit – III Numerical Methods** 3.1 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method.	3.1 Solve the system of equations in three unknowns by iterative methods.	**05**	**10**	**CO5**
4	**Unit – IV Probability Distribution** 4.1 Binomial distribution. 4.2 Poisson's distribution. 4.3 Normal distribution	4.1 Solve given problems based on repeated trials using Binomial distribution. 4.2 Solve given problems when number of trials are large and probability is very small. 4.3 Utilize the concept of normal distribution to solve related engineering problems.	**06**	**15**	**CO3**
5	**Unit - V Differential Equation** 5.1 Concept of Differential Equation. 5.2 Order, degree of Differential equations. 5.3 Methods of solving differential equations: Variable separable form, Linear Differential Equation.	5.1 Find the order and degree of given differential equations. 5.2 Solve given differential equations using the methods of Variable separable. 5.3 Solve given Linear Differential Equation.	**06**	**10**	**CO4**
6	**Unit - VI Numerical Methods** 6.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton –Raphson method. 6.2 Bakhshali iterative method for finding approximate square root. (IKS)	6.1 Find roots of algebraic equations by using appropriate methods. 6.2 Solve problems using Bakhshali iterative method for finding approximate square root. (IKS)	**06**	**10**	**CO5**

E) TUTORIAL (BASED ON CL & TL) ASSESMENT WORK –

Sr. No.	Tutorial Titles	Unit No.	Hrs.
1	Simple problems of Integration as Anti Derivatives	I	1
2	Integration by substitution method	I	1
3	Integration by partial fractions (only linear non repeated factors at denominator of proper fraction.	I	1
4	Integration by parts.	II	1
5	Examples on Definite Integral based on given methods and properties of definite integral.	II	1
6	Area under the curve and Mean value.	II	1
7	Order, degree and formation of differential equation.Variable separable method.	III	1
8	Linear differential equation.	III	1
9	Bisection method and Regula falsi method.	IV	1
10	Newton- Raphson method.	IV	1
11	Jacobi's method and Gauss Seidal Method.	V	1
12	Bakhshali iterative methods for finding approximate value of square root. (IKS)	V	1
13	Binomial Distribution	VI	1
14	Poisson Distribution	VI	1
15	Normal Distribution	VI	1

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

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G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

-

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Aligned COs	R-Level	U-Level	A-Level	Total Marks
1	I	Indefinite Integration	CO1	3	8	4	15
2	II	Definite Integration	CO2	2	4	4	10
3	III	Numerical Methods	CO5	2	4	4	10
4	IV	Probability Distribution	CO3	3	8	4	15
5	V	Differential Equation	CO4	2	4	4	10
6	VI	Numerical Methods	CO5	2	4	4	10
Grand Total				**10**	**28**	**32**	**70**

I) ASSESMENT TOOL –

- **Formative assessment**

  unit test, each of 30 marks and average of 2-unit test

- **Summative Assessment**
  End semester Assessment Theory Examination of 70 marks

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi, 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978- 81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81- 265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455
5	S. S. Sastry	Introductory Methods of Numerical Analysis	PHI Learning Private Limited, New Delhi. ISBN-978-81-203-4592-8
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (lndia) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
7	Marvin L. Bittinger David J.Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten,Trevor Hastie Robert antibiogram	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht LondonISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)

- **SOFTWARE/ TOOLS/ MODELS**

Open-source software like wolfram alpha, Sage Maths, MATHS3D, GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.

- **WEBSITES LINKS**

Sr. No.	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/ -SCI Lab	Signal processing, statistical analysis, image enhancement.
3	www.mathworks.com/product/matlab/ -MATLAB	Applications of concepts of Mathematics to coding.
4	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, Google Sheets.
5	https://ocw.mit.edu/	MIT Course ware

Sr. No.	Link / Portal	Description
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.
8	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) in Mathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

K) CO-PO-PSO Matrix –

Course Outcomes (COs)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO- 1	PSO- 2	PSO- 3
CO1	2	1	-	-	-	-	1	-	-	1
CO2	2	1	-	-	-	-	1	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	1	-	-	-
CO5	2	1	-	-	-	-	-	1	-	-

Legends: - High:03, Medium:02, Low:01

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Basic electrical and electronics engineering
Course code	R23CP1301
Course Category	AEC
Credits	5

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
							FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	4	2	10	5	1.5	30	70	100	40	50	20	50@	20	50	20	250

Abbreviations:
CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment **,** @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

A) RATIONALE

Diploma engineers come across machines and equipments involving components and devices based on principles of Electrical and Electronics Engineering and also in our day to day life. Electrical and Electronics Engineering forms the foundation for understanding the hardware components of computer systems. It helps them comprehend how computers process and store information at the hardware level.

The basic concepts studied in this subject will be very useful for higher level subjects in further study.

This course is designed with basic information to help students apply basic concepts, rules, and safety rules of electrical engineering and electronic engineering and perform practical's thereof.

B) INDUSTRY / EMPLOYER EXPECTED OUTCOME

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs)leading to the attainment of following industry identified outcomes expected from this course: Apply basic concept of electrical and electronics engineering in various applications in relevant technical fields.

C) COURSE OUTCOMES (COs)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Calculate and measure basic electrical quantities and parameters.

CO2 - Use different electrical machines by making connections.

CO3 - Use electrical safety devices in electrical circuit

CO4 - Use relevant diode in different electronic circuits.

CO5 - Use BJT and FET in various electronic circuits.

CO6 - Use various types of sensors and transducers.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Unit - I Basic Electrical Fundamentals** 1.1 Electric and magnetic circuits. 1.2 Series and parallel magnetic circuits. 1.3 Faraday's laws of electromagnetic induction, Fleming's right hand rule, Lenz's law 1.4 Dynamically and statically induced emf, self and mutual inductance 1.5 AC and DC quantity, advantages of AC over DC supply. 1.6 Single phase AC, sinusoidal AC wave: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, RMS value, Average value for sinusoidal waveform, form factor, peak factor. 1.7 Three phase supply system over single phase supply system, Phase sequence and balanced and unbalanced load 1.8 Star and delta connections, Phase and line current, phase and line voltage in star connected and delta connected balanced system.	TLO 1.1 Apply Faraday's law of electromagnetic induction and Fleming's right hand rule, Lenz's law for induced emf to find its magnitude and direction. TLO 1.2 Differentiate alternating current (AC) and direct current (DC) TLO 1.3 Explain parameters of single phase AC sinusoidal waveform. TLO 1.4 Describe the silent features of three phase AC supply system. TLO 1.5 Explain star and delta connection in three phase AC system. TLO 1.6 Calculate the phase and line current and voltage in star and delta connections.	**11**	**15**	**CO1**
2	**Unit - II Electrical Machines.** 2.1 Transformer: Working principle, emf equation, Voltage ratio, current ratio and transformation ratio, losses. 2.2 DC motor construction - parts its function and material used. 2.3 DC motor -Principle of operation. 2.4 Types of DC motors, schematic diagram, applications of dc shunt, series and compound motors. 2.5 Universal motor: principle of operation, reversal of rotation and applications. 2.6 Stepper motor: types, principle of working and applications.	TLO 2.1 Explain the working principle of the given type of transformer. TLO 2.2 Distinguish the construction of the given type of transformer. TLO 2.3 Describe the construction and working of the given type of DC motor. TLO 2.4 Select relevant type of DC motor for the given application with justification TLO 2.5 Explain working principle and operation of Universal motor. TLO 2.6 Describe the procedure to connect stepper motor for the given application with sketches.	**10**	**10**	**CO2**
3	**Unit - III Electrical Safety and Protective Devices.** 3.1 Low rating Fuse: Operation, types 3.2 Switch Fuse Unit and Fuse Switch Unit: Differences, use of multi meter for electrical quantities/ parameters measurements. 3.3 MCB and ELCB/RCB: Operation and general specifications	TLO 3.1 Describe the characteristics and features of the given type of protective device. TLO 3.2 Select the relevant protective device for the given application with justification TLO 3.3 Select suitable switchgear for the given situation with justification.	**9**	**10**	**CO3**

	3.4 Earthing: Types, Importance of earthing, factors affecting earthing resistance. 3.5 Measures for reducing earth resistance, I.E rules relevant to earthing.	TLO 3.4 state the I.E. rule related to be applied for the given type of earthling with justifications.			
4	**Unit-IV Special purpose diodes and their applications.** 4.1 PN Junction Diode: working, symbol, applications. 4.2Zener diode: working, symbol, applications. 4.3LED: working, symbol, applications. Filters: Need for filters, circuit diagram and 4.4Working of L, C and CLC filter. 4.5regulated power supply: Working principle and block diagram 4.6 UPS :Block diagram of Online and Offline UPS	TLO 4.1 Measure Zener voltage on given V-I characteristics of the Zener diode. TLO4.2Explaintheworking principle of LED. TLO 4.3 Describe the working principle of given type of filter. TLO 4.4 Explain the working principle of regulated power supply and UPS.	**10**	**10**	**CO4**
5	**Unit –V Transistors.** 5.1 BJT: Types, symbol, construction and working principle of NPN transistor. Transistor configurations :CB,CE,CC Characteristics of transistor in CE configuration. Transistor parameters: Alpha, beta and derive relation between them. Applications-Transistor as a switch and as an amplifier. FET: Types, symbol, construction and working principle of n channel JFET. Characteristics of JFET: Drain and Transfer characteristics.	TLO 5.1 Describe with sketches the construction and working of the given type of transistors. TLO5.2Comparetheperformanceof the given transistor configurations TLO 5.3 Explain applications of transistor as a switch and amplifier. TLO 5.4 Explain with sketches the construction and working of the given type of FET.	**12**	**15**	**CO5**
6	**Unit -VI Sensors and Transducers.** Sensors and Transducers: Basic definition, difference, classification. Thermal, Optical, Electric sensors Transducers : Need of transducer, types of transducers: Primary, Secondary, Active, Passive, Analog , Digital Selection criteria of transducer	TLO6.1Selectrelevanttransducerfor given application. TLO6.2Differentiatethefeaturesof transducers and sensors for given quantity measurement. TLO6.3Explainwithsketchesthe working principle of given type of thermal, optical sensors.	**8**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1.	LLO 1.1 Use electrical meters for measurement of electrical parameters. LLO 1.2 Identify presence of magnetic flux lines.	*Measure the parameters of simple electrical and identify presence of flux lines in magnetic circuit.(e.g. current, voltage, power, flux)	2	CO1
2.	LLO 2.1 Interpret the AC waveform for resistive and inductive circuit displayed on CRO.	*Measure frequency, time period, rms value, peak value of sinusoidal AC waveform for resistive and inductive circuit using CRO.	2	CO1
3.	LLO 3.1 Measure the phase difference between voltage and current in the AC circuit of the inductive circuit.	Phase difference of voltage and current in inductive circuit.	2	CO1
4.	LLO 4.1 Measure the line voltage, phase voltage a, phase current, and line current in three phase star connected balanced load. LLO 4.2 Determine phase voltage and line current relation in star connected load.	*Measure the line voltage, phase voltage and phase current and line current in three phase star connected balanced load.	2	CO1
5.	LLO 5.1 Find the phase voltage and line current relation in delta connected load.	Measure the line voltage, phase voltage and phase current and line current in three phase delta connected balanced load.	2	CO1
6.	LLO 6.1 Determine the transformation ratio.	*Determination of the voltage and current ratio of single phase transformer.	2	CO2
7.	LLO 7.1 DC shunt motor operation.	*Operate DC shunt motor by connecting three point starter.	2	CO2
8.	LLO 8.1 DC series motor operation	Operate DC series motor by connecting three point starter	2	CO2
9.	LLO 9.1 Speed reversal of universal motor.	*Reverse the direction of rotation of universal motor.	2	CO2
10.	LLO 10.1 Demonstrate stepper motor operation.	Demonstrate the operation of stepper motor for various speed rotations.	2	CO2
11.	LLO 11.1 Use of multi meter for measurement.	*Use multi meter for measurement of voltage, current (AC,DC), resistance and continuity of the given electrical circuit.	2	CO3
12.	LLO 12.1 Connection of fuses in electrical circuit.	Connect fuse in electrical circuit and check its operation at normal and abnormal conditions.	2	CO3
13.	LLO 13.1 Connection of MCB in electrical circuit	*Connect MCB in electrical circuit and check its operation at normal and abnormal conditions.	2	CO3
14.	LLO 14.1 Connection of ELCB in electrical circuit.	Connect ELCB in electrical circuit and check its operation at normal and abnormal conditions.	2	CO3
15.	LLO 15.1 Measurement of earth resistance.	Use of earth tester for measurement of earthing resistance of a installed earthing of laboratory.	2	CO3
16.	LLO 16.1 Check the forward and reverse bias V-I characteristics of Zener diode.	*Connect the Zener diode in the circuit and test its operation in forward and reverse bias mode.	2	CO4
17.	LLO17.1 Find the voltage regulation of Zener diode.	*Determine the voltage regulation by using Zener diode under variable input and output conditions.	2	CO4

18.	LLO18.1 Filter the ripples by using L, C and pi filter.	Check the output wave form of L, C and π filters on CRO of rectifier circuit.	2	CO4
19.	LLO19.1 Check the operation of UPS under online and offline mode.	*Make the input and output connections of UPS and measure the output voltage under online and offline mode.	2	CO4
20.	LLO20.1 Check the abnormal and normal operation of UPS.	*Make the input, output connections and check the operation of UPS under normal and overload condition.	2	CO4
21.	LLO21.1 Check the operation of NPN transistor under CE configuration.	*Test input/output characteristics of NPN transistor in CE configuration.	2	CO5
22.	LLO22.1 Check the operation of NPN transistor under CB configuration.	Test input/output characteristics of NPN transistor in CB configuration.	2	CO5
23.	LLO23.1 Check operation of transistor for ON and OFF conditions.	*Check the switch ON and switch OFF condition of LED by using transistor.	2	CO5
24.	LLO24.1Use FET (BFW10) to plot drain and transfer characteristics.	Determine the Drain and Transfer characteristics of FET.	2	CO5
25.	LLO25.1 Use of RTD (PT-100)for Measurement of temperature.	*Measure temperature of liquid using RTD (PT-100) transducer.	2	CO6
26.	LLO 26.1 Use active transducer (thermocouple)for measurement of temperature.	Measure temperature of liquid using thermocouple measurement.	2	CO6
27.	LLO27.1 Use of photo electric sensor to sense motion.	Check the motion of given object using photoelectric sensor.	2	CO6
28.	LLO28.1 Use Passive transducer to measure resistance.	*Measure the resistance of LDR in varying light intensity.	2	CO6
29.	LLO29.1 Use Passive transducer to measure displacement.	Measure displacement using LVDT.	2	CO6
30.	LLO30.1UsePassivetransducerto measure displacement.	Measurement of displacement using potentiometer.	2	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

- **Micro project**

Basic Electrical Engineering:

1) Prepare an electrical circuit comprising of one lamp and switch and measure current of the circuit.
2) Prepare a model of two resistances connected in series and parallel and measure the resistance of both circuits.
3) Prepare a magnetic circuit model to demonstrate magnetic force of line (flux) and check its properties.
4) Prepare a model to demonstrate Faraday's laws of electromagnetic induction.
5) Prepare a model to demonstrate dynamically and statically induced EMF.
6) Prepare a test lamp and check the supply continuity using it.
7) Connect two small battery cells (AA size) make series and parallel connections and measure the voltage of both connections.
8) Visit to supply panel of 3-phase and 1-phase AC supply and identify the supply connection.
9) Prepare star /delta connection model using three filament lamps.
10) Collect a small transformer and make model showing the input and output winding connection.
11) Collect the parts of a small transformer and make a demonstration model.
12) Prepare a demonstration model of DC motor. Collect different types of small rating fuses and make a demonstration chart.
13) Prepare a switchboard containing one switch, one fuse, and one socket and test it.
14) Collect MCB dismantle it and prepare a demonstration model showing actual parts of MCB.

- **Basic Electronics Engineering:**

1) Transistor: Build a circuit to switch ON and OFF LED using BJT as a switching component.
2) Voltage Regulator: Build a DC regulated power supply circuit on a general purpose PCB for +9V output voltage.
3) Transistor: Build circuit using transistor to amplify the AC input signal of 200 V.
4) FET: Build a circuit using FET to amplify the AC input signal of 300mV.

5) LDR: Build a circuit of an Automatic street light controller using LDR on general purpose PCB.

Note: Encourage students to prepare Small models, Sample list of micro projects are given. Teacher can give other micro project concern to course curriculum

Note:
A suggestive list of micro project and assignment is given here. Similar activities could be added by the course teacher. By considering allotted self learning hour work course teacher has to allocate judicial mix of task may be combination of assignments and / or micro projects. Micro project is expected to complete as a group activity. Course teacher can assign specific learning or any other skill development task. According to task assign, course teacher can set rubrics for continuous (formative) type assessment. SLA marks shall be awarded as per continuous assessment record.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Single Phase Transformer: 1kVA, single-phase, 230/150 V, air cooled	6
2	Single phase auto transformer (Dimmer stat) – 0-230 volt 2/5Amp	6,13
3	CRO - 20 MHz. Dual channel	2,3,18
4	Three phase Auto Transformer -10/5 kVA, Input 415 V 3 phase. 50 Hz. Output 0-415 V, 10/20 A	4,5
5	Rheostat (0-500 Ohm, 1.2A), Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	7
6	Rheostat (0-100 Ohm, 5A), Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	8
7	DC Ammeter range (0-5-10A), Portable analog PMMC type as per relevant BIS standard	7
8	DC series and shunt machines at least one each (up to 230 V, 3/5 HP).	7,8
9	D. C. Supply, A 230 V d.c. supply (with inbuilt rectifier to convert a.c.to d.c)	7,8
10	DC Voltmeter Range (0-150/300V), Portable analog PMMC type as per relevant BIS standard.	7,8
11	AC Ammeter range (0-2.5-5-10A), Portable analog MI type as per relevant BIS standard	5,6,13,14
12	AC Voltmeter Range (150/300/600V), Portable analog MI type as per relevant BIS standard	5,6
13	Lamp Bank load -230 V 0-10 A	13,14
14	Tachometer, noncontact type 0-10000rpm	7,8,9,10
15	Single phase Universal motor -1/4 or 1/2 HP ,230 V	9
16	Earth tester analog/digital type	15
17	Variable DC power supply 0-30V, 2A, SC protection, display for voltage and current.	16,17,21,22,23,24
18	Digital Multimeter: 3 1/2 digit	1,16,17,21,22,23
19	Electronic Work Bench: Bread Board: 840 tie points, Withstanding Voltage: 1,000V AC, Positive and Negative power rails on opposite side of the board, connecting wires.	16,17,18,21,22,23,24

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U - Level	A-Level	Total Marks
1	I	Basic Electrical Fundamentals	CO1	12	4	7	4	**15**
2	II	Electrical Machines.	CO2	11	2	4	4	**10**
3	III	Electrical Safety and Protective Devices.	CO3	9	2	4	4	**10**
4	IV	Special purpose diodes and their applications.	CO4	11	2	4	4	**10**
5	V	Transistors	CO5	12	5	6	4	**15**
6	VI	Sensors and Transducers	CO6	9	2	4	4	**10**
Grand Total				**64**	**18**	**30**	**22**	**70**

I) ASSESMENT TOOL –

Formative assessment (Assessment for Learning)

- Two offline unit tests of 30 marks (Basic Electrical of 15 marks, Basic Electronics of 15 marks) and average of two unit test marks will be consider for out of 30 marks.
- For formative assessment of laboratory learning 50 marks (Basic Electrical -25 marks, Basic Electronics- 25 marks).
- Each practical will be assessed considering 60% weightage to process, 40% weightage to product.
- Note: Unit test will be conducted on written pattern (Not MCQ based)

Summative Assessment (Assessment of Learning)

- End semester assessment of 70 marks through online MCQ examination.
- End semester summative assessment of 50 marks for laboratory learning (Basic Electrical- 25 marks, Basic Electronics- 25 marks)

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Author	Title	Publisher with ISBN Number
1	Theraja, B. L. Theraja, A. K.	A Text Book of Electrical Technology Vol-I	S.Chand and Co. New Delhi 2014 ISBN: 9788121924405
2	Mittle, V. N.	Basic Electrical Engg.	Tata McGraw-Hill, New Delhi ISBN : 978-0-07-0088572-5
3	Sedha R.S.	Applied Electronics	S. Chand, New Delhi,2015 ISBN:9788121927833
4	Hughes, Edward	Electrical Technology	Pearson Education, New Delhi ISBN-13: 978-0582405196
5	V.K. Mehta	Principles of Electronics	S.Chand and Co Ram Nagar, New Delhi-110055,11th edition 2014 ISBN 9788121924504
6	Saxena, S. B. Lal	Fundamentals of Electrical Engineering	Cambridge University Press, New Delhi ISBN : 9781107464353
7	Jegathesan, V.	Basic Electrical and Electronics Engineering	Wiley India, New Delhi 2014 ISBN : 97881236529513

Sr.No	Author	Title	Publisher with ISBN Number
8	Boylestad, Robert Nashelsky Louis	Electronic Devices and Circuit Theory	Pearson Education. New Delhi 2014 ISBN:9780132622264
9	Sawhney A.K.	Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai and Sons, New Delhi,2005, ISBN:13-9788177000160
10	Kalsi H.S.	Electronic Instrumentation	McGraw Hill, New Delhi,2010 ISBN:13-9780070702066

- **WEBSITES LINKS**

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=anCnrtjNLQM	LVDT
2	https://qr.page/g/4PABoASTZYW	Transistor as an Amplifier
3	https://youtu.be/XT-UmPviH64?si=MLIZBB5BgOA2SWBk	Electromagnetic Induction
4	https://youtu.be/M-QfX2fvpp4?si=xpZDAiX3-_7xrnnr	Basics of magnetic circuits
5	https://archive.nptel.ac.in/courses/117/106/117106108/	Basic electrical circuits
6	https://archive.nptel.ac.in/courses/108/105/108105155/	Electrical Machines-1
7	https://youtu.be/ivP_8w4FegE?si=5BLH_hvyhros570A	Single phase and Three phase electrical system
8	https://byjus.com/physics/working-principle-of-an-electrical -fuse/	Electrical fuse
9	https://youtu.be/9Xgn40eGcqY?si=YQy0vmxQ_yGR8-tz	Miniature circuit breaker
10	https://youtu.be/ikLhqUCQKkc?si=8VqRbV1zZlQUSYLd	Earth leakage circuit breaker
11	https://www.tutorialspoint.com/difference-between-bjt-and-fe t	BJT's and FET's
12	https://www.tutorialspoint.com/difference-between-sensor-and -transducer	Sensors and Transducers
13	https://www.electrical4u.com/jfet-or-junction-field-effect-transistor/	Junction Field Effect Transistor
14	https://fossee.in/	Open Source Electronics Simulation software
15	https://cloud.scilab.in/	Open Source Scilab Cloud for Electronics Simulation

K) CO-PO Matrix –

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	-	-	2	-	-	2	1	-	1
CO2	2	-	-	2	-	-	2	2	-	1
CO3	2	-	-	3	2	-	3	2	-	1
CO4	3	-	-	1	-	-	2	1	-	1
CO5	3	-	-	1	-	-	2	2	-	1
CO6	2	-	-	2	2		3	2		1

Legends: - High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer
Course Name	Programming in c
Course code	R23CP1401
Course Category	AEC
Credits	5

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	1	4	1	10	5	3	30	70	100	40	50	20	50#	20	25	10	225

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

'C' programming language helps to build a strong foundation for computer programming. This course will help to solve beginner level problems such as mathematical operations, string processing, data structure and data structure related processing, with the help of basic concepts, control flow structures, and principles of C. This course is basically designed to create a base to develop foundation skills of procedure - oriented programming.

B) EXPECTED SKILL/s –

The aim of this course is to help the students to attain the following industry identified outcome through various teaching learning experiences: Develop 'C' programs that address issues with processing strings, mathematic operations, and data structures.

C) COURSE OUTCOMES (COs)

Students will be able to achieve & demonstrate the following COs on completion of course based learning:

1 - Develop C program using input - output functions and arithmetic expressions
2 - Develop C program involving branching and looping statements
3 - Implement Arrays and structures using C programs
4 - Develop C program using user-defined functions
5 - Write C program using pointer
6-Explain the basic concept of file handling, testing, debugging and simple IoT applications using C programs.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**Unit - I Basics of 'C' Programming** **1.1 Fundamentals of algorithms:** Notion of algorithm, Notations used for assignment statements and basic control structures. **1.2 Introduction to 'C':** General structure of 'C' program, Header file, 'main ()' function. **1.3 Fundamental constructs of 'C':** Character set, tokens, keywords, Identifiers, Constants - number constants, character constants, string constants, Variables. Data types in 'C': Declaring variables, data type conversion. **1.4 Basic Input and Output functions:** input and output statements using printf(), scanf() functions. **1.5 Assignments and expressions:** simple assignment statements, arithmetic operators, shift operators , bitwise operators, sizeof operator.	LO 1.1 Write algorithm for given problem statement. LO 1.2 Identify the given building blocks of a C Program. LO 1.3 Use basic constructs like constants, variables, data types for developing C program. LO 1.4 Write C programs using printf () and scanf() functions. LO 1.5 Write C programs using arithmetic operators, bitwise operators.	**9**	**10**	**CO1**
2	**Unit - II Control structures** **2.1 Conditional statements:** Relational operators, logical operators, if -statement, if-else statements, nested if-else statements, if-else ladder, switch statement. **2.2 Looping statements:** while loop, do… while loop, for loop. **2.3 Branching Statements:** goto statement, use of 'break' and 'continue' statements.	LO 2.1 Write a 'C' program using decision making statements. LO 2.2 Use loop statements in C program to solve iterative problems. LO 2.3 Use appropriate statement to alter the program flow in the loop.	**12**	**15**	**CO2**

3	**Unit - III Arrays and structure** **3.1 Characteristics of an array:** One dimension and two dimensional arrays, concept of multi-dimensional arrays. **3.2 Array declaration and Initialization**. **3.3 Operations on Arrays.** **3.4 Character and String input/output and String related operations.** **3.5 Introduction and Features of Structures, Declaration and Initialization of Structures, array of structures.** **3.6 Type def, Enumerated Data Type.**	LO 3.1 Write a C Program to perform operations on one dimensional array. LO 3.2 Declare, initialize, and access elements of two dimensional array. LO3.3Declare, initialize and access data using Structure. LO 3.4 Explain typedef and enum.	**12**	**15**	**CO3**
4	**Unit - IV Functions** **4.1 Concept and need of functions.** **4.2 Library functions:** Math functions, String handling functions, other miscellaneous functions such as getchar(), putchar(), malloc(), calloc(). **4.3 Writing User defined functions -** function definition, functions declaration, function call, scope of variables - local variables, global variables. **4.4 Function parameters**: Parameter passing- call by value & call by reference, function return values, function return types, declaring function return types, The 'return' statement. **4.5 Recursive functions.**	LO 4.1 Explain need of Functions in C program. LO 4.2 Write C Program involving C library functions. LO 4.3 Write user defined functions for given problem in C program. LO 4.4 Write C Program for calling function by 'value' and calling function by 'reference'. LO 4.5 Implement recursive function in C program.	**9**	**10**	**CO4**
5	**Unit - V Pointers** **5.1 Introduction to Pointers:** Definition, use of pointers, '*' and '&' operators, declaring, initializing, accessing pointers. **5.2 Pointer arithmetic.** **5.3 Pointer to array.** **5.4 Pointer and Text string.** **5.5 Function handling using pointers.** **5.6 Pointers to structure.**	LO 5.1 Declare and Define Pointer Variable. LO 5.2 Write C program to print the address and values of pointer variables. LO 5.3 Write C program to perform arithmetic operations using pointers. LO 5.4 Write C Program to perform operations on Arrays using Pointers. LO 5.5 Explain string related operations using pointer.	**9**	**10**	**CO5**

		LO 5.6 Access individual variable of structure using Pointer.			
6	**Unit-VI File Handling** **6.1 File operations –**opening, reading, writing & closing file. **6.2 Testing and Debugging:** Definition, difference between Testing and Debugging, Types of program errors, Testing a program, Debugging a program for logic error and syntax errors. **6.3 IoT Applications Using C:** Arduino Based Concepts and its algorithms -Sense the Available Networks ,Measure the Distance Using Ultrasonic Sensor and Make Led Blink , Detect the Vibration of an Object ,Connect with the Available Wi-Fi ,Sense a Finger When it is Placed on Board, Temperature Notification	LO 6.1 Learn the basic file handling operations and Understand the difference between testing and debugging. LO 6.2 Write C Program to implement simple IoT applications.	**9**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1	*Install and study the C programming environment.	LLO 1.1 Write logical steps for given program flow LLO1.2Write the standard English like statements for programming flow of given problem statement.	**2**	**CO1**
2	Implement C programs using Constants and Variables.	LLO 2.1 Write Simple C program using constant and variables. LLO 2.2 Use the arithmetic operators for developing C Program.	**2**	**CO1**
3	*Implement C programs using arithmetic operators to solve given arithmetic operations.	LLO 3.1 Use Arithmetic operators in C Program.	**2**	**CO1**
4	Implement C programs using implicit and Explicit data type conversion.	LLO 4.1 Write code for type casting in C.	**2**	**CO1**
5	*Write well commented C programs using formatted. Input/ Output statements. E.g. Sample Output.	LLO 5.1Write C code for Displaying formatted output with comments wherever Applicable.	**2**	**CO1**
6	*Implement minimum two C programs using Relational and conditional operator.	LLO6.1 Use Relational and logical operators in C to solve given problem. LLO 6.2 Write C program using Relational and logical operators for solving given problem.	**2**	**CO2**
7	*Implement minimum two C programs using Logical Operators.	LLO 7.1 Use logical operators in given expressions.	**2**	**CO2**
8	Implement minimum two C programs using Bitwise Operators.	LLO 8.1 Write expressions using bitwise operators in given problem statement.	**2**	**CO2**

9	Implement minimum two C programs using simple If statement and if..else statement.	LLO 9.1 Write the syntax for various if statements. LLO 9.2 Write C program for any problem using If statements.	**2**	**CO2**
10	*Implement minimum two C programs using nested if..else statement and if..else if ladder.e.g.- Write and Execute the C program to print the grades of students based on percentage. Grade: Distinction If per>=75 Grade: A If per>=60and Per < 75 Grade: B If per>=55 and Per<60 Grade: Pass If per>=40 and Per<55 Grade: Fail If per<40	LLO 10.1 Write syntax of if..else statements.	**2**	**CO2**
11	*Develop C program using Switch statements	LLO 11.1 Write syntax of Switch statement to solving given problem	**2**	**CO2**
12	*Write a C program to print English Calendar months as per given number (eg: If input is 4 then print “April”) using Switch statement.	LLO 12.1 Write C program using Switch statement.	**2**	**CO2**
13	*Implement minimum two C programs using 'while' loop and 'do...while' loop statements.	LLO 13.1 Implement iterative solution to problem using while and do—while loop	**2**	**CO2**
14	Implement C programs using for loop statement (e.g. - Write a C Program to print numbers from1 to100).	LLO 14.1 Write the syntax for statement. LLO 14.2 Write C code for solving given problem using for loop.	**2**	**CO2**
15	* Print various patterns using loops. e.g. -Write C Program to print following or similar pattern.	LLO 15.1 Write syntax for while and do...while loop LLO 15.2 Write syntax for 'for' loop	**2**	**CO2**
16	* Implement C programs using One Dimensional Array.(e.g.-Write C program to input 5 numbers using array and display sum of it).	LLO 16.1 Declare and initialize the Array. LLO 16.2 Write C program for implementation of one dimensional array.	**2**	**CO3**
17	* Implement C programs using Two Dimensional Array. (E.g.-Write C program to calculate addition of two 3X3 matrices.)	LLO17.1Declare and initialize two dimensional Array. LLO 17.2 Write C program for implementation of two dimensional arrays.	**2**	**CO3**
18	* Write C program to perform following operations without using standard string functions. i) Calculate Length of given string ii) Print reverses of given string.	LLO 18.1 Declare character array as Strings in C. LLO 18.2 Write C programs for print string operations without using string handling functions.	**2**	**CO3**
19	Implement ‘Structure’ in C (e.g. - Add and Subtract complex numbers using structure)	LLO 19.1 Declare, define and access structure variables.	**2**	**CO3**
20	* Implement ‘ Array of Structure’ in C (e.g.-Accept and Display 10 Employee information using structure)	LLO 20.1 Write C programs using Array of Structure.	**2**	**CO3**
21	*Develop C program using in-built mathematical and string functions.	LLO 21.1 Use built-in library functions in C programs.	**2**	**CO4**

22	* Write C program to demonstrate User defined Functions.	LLO 22.1 Write C programs using user defined functions.	**2**	**CO4**
23	Implement recursive functions in C program.	LLO 23.1 Write Recursive functions in C.	**2**	**CO4**
24	*Write C Program to print addresses and values of variables using Pointer. (E.g.-Write C program to access and display address of variables.)	LLO 24.1 Declare and initialize pointer variables LLO 24.2 Write C program to access variables using pointers.	**2**	**CO5**
25	*Implement C Programs to perform arithmetic operations using Pointer.	LLO 25.1 Perform arithmetic operations using pointers.	**2**	**CO5**
26	*Implement Program to read and write a file.	LLO 26.1 Program to read and write a file.	**2**	**CO6**
27	*Develop C program to demonstrate the different file operations.	LLO 27.1 Program to read and write a file.	**2**	**CO6**
28	Develop C Program to Sense the Available Networks Using Arduino.	LLO 28.1 Program to Sense the Available Networks	**2**	**CO6**
29	Develop C Program to Measure the Distance Using Ultrasonic Sensor and Make Led Blink Using Arduino.	LLO 29.1 Program to Measure the Distance Using Ultrasonic Sensor and Make Led Blink	**2**	**CO6**
30	Write C Program to Detect the Vibration of an Object Using Arduino.	LLO 30.1 Program to Detect the Vibration of an Object	**2**	**CO6**
31	Implement C Program to Connect with the Available Wi-Fi Using Arduino.	LLO 31.1 Program to Connect with the Available Wi-Fi	**2**	**CO6**
32	Write C Program to Sense a Finger When it is Placed on Board Using Arduino.	LLO 32.1 Program to Sense a Finger When it is Placed on Board	**2**	**CO6**
33.	Write Program for Temperature Notification Using Arduino.	LLO 33.1 Program for Temperature Notification	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

- **Self learning:**

1. Complete any one course related to Programming in C on Infosys Spring board.
2. Develop C language code for relevant topics suggested by the teacher.

- **Assignment:**

Solve an assignment on any relevant topic given by the teacher.

- **Micro project:**

The micro project has to be Industry Application Based, Internet-based, Workshop-based, Laboratory - based or Field-based as suggested by Teacher.

1. Prepare a simple calculator to perform mathematical operations. Accept values and operations to be performed from user. Allow only numeric values else show appropriate messages to user.
2. Prepare menu driven program for Invoice management system. Accept user inputs and generate receipt and calculate amounts as per purchased items.
3. Develop employee leave management system to display leave related information of employee.
4. Develop food menu card for restaurant .Display food items. Accept food menu, quantity and generate bill for

the same.
5. Develop a menu-driven program to perform matrix operations-matrix addition, matrix multiplication, transpose of matrix.
6. Develop any one simple IoT based application suggested by teacher

G) LABORATORY LEARNINGEQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system- (Any computer system with basic configuration)	All
2	'C' Compiler (Any)	All
3	ARDUINO ,Wi-Fi Module or ESP 8266 Module, Ultra sonic sensor, Jumper wires, Vibration sensor, Touch Sensor, Temperature and humidity sensor, Connecting cable or USB cable,	23.3 To.26.7

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Basics of 'C' Programming	CO1	9	4	2	4	10
2	II	Control structures	CO1,CO2	12	5	5	5	15
3	III	Arrays and structure	CO3	12	5	5	5	15
4	IV	Functions	CO4	9	2	4	4	10
5	V	Pointers	CO5	9	2	4	4	10
6	VI	File Handling	CO6	9	2	4	4	10
Grand Total				**60**	**20**	**24**	**26**	**70**

I) ASSESMENT TOOL –

- **Formative assessment**
  1. Continuous assessment based on process and product related performance indicators
  2. Each practical will be assessed considering
     i. 60% weight age to process.
     ii. 40% weight age to product.
  3. A continuous assessment based term work
- **Summative Assessment**
  End semester examination, Lab performance, Viva voce.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No	Author	Title	Publisher with ISBN Number
1	E. Balaguru swamy	Programming in ANSI 'C'	Mc graw Hill Publications ISBN0070534772
2	Yashwant Kanetkar	Let us 'C'	BPB Publication ISBN9788183331630
3	David Griffiths, Dawn Griffiths	Head First C	O'Reilly Media,Inc.ISBN:9781449345013

- **WEBSITES LINKS**

Sr. No	Link/Portal	Description
1	https://nptel.ac.in/courses/106104128	C Programming
2	https://jsommers.github.io/cbook/control.html	Control structures , flow control statements in C
3	https://www.learn-c.org/en/Functions	Functions
4	https://www.simplilearn.com/tutorials/c-tutorial/pointers-in-c	Pointers
5	https://www.w3schools.com/c/	C Programming
6	https://www.javatpoint.com/c-programming-language-tutorial	C Programming tutorial
7	https://www.programiz.com/c-programming	C Programming
8	https://www.programiz.com/c-programming/online-compiler/	Online C compiler

K) CO-PO-PSO Matrix –

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustain ability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	2	1	-	-	1	-	-	2
CO2	2	3	3	2	-	-	2	2	2	-
CO3	2	3	3	3	-	2	2	-	-	-
CO4	1	3	3	3	1	2	3	-	-	2
CO5	1	3	3	3	1	1	3	-	-	-
CO6	1	2	3	2	1	3	3	1	-	-

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Linux basics
Course Code	R23CP2401
Course Category	DSC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Paper Duration (hrs.)	Assessment Scheme										
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week			Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

Abbreviations:
CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA - Self-Learning Assessment
Legends: **@ - Internal Assessment**, # - External Assessment, *# - On-Line Examination, @$ - Internal Online Examination

A) RATIONALE

Linux Operating System is Open source and freely distributed Operating System (O.S). Knowledge of LINUX operating system is essential as it provides many features such as multitasking, multiuser, security etc., which are mainly used in both server and workstation systems. Contents of this course familiarize students with the basics of Linux, Manage files and directories, writing Shell scripts, and command line essentials.

B) INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following industry-identified outcomes through various teaching-learning experiences.

1) To understand the basics of Linux operating system fundamentals.
2) Ability to perform file, directory operations and use vi editor.
3) To learn the Basic Scripting Skills and creating custom shell scripts.

C) COURSE OUTCOMES (COs)

Students will be able to-

CO1 - Install Linux operating system.
CO2 - Execute general-purpose commands of the Linux operating system.
CO3 - Manage files and directories in Linux operating system.
CO4 - Use vi editor in Linux operating system.
CO5 - Execute Linux filters and commands using regular expressions.
CO6- Write programs using shell script.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	CO Mapped
1	**Unit - I Introduction to Linux Operating System** **1.1** Introduction to Operating System and Linux. **1.2** History, Overview of Linux, architecture **1.3** Shell: Bourne, Korn, Cshell. **1.4** Linux releases Linux File Systems (ext) and versions.	1.1 Describe the History of Linux. 1.2 Identify different types of shells. 1.3 Compare Linux file systems.	**4**	**CO1**
2	**Unit - II General Purpose Utilities** **2.1 cal**: The calendar, **date**: Displaying the system date, **echo**: Displaying message, **printf**: An alternative to echo, **bc**: The calculator, **script**: Recording your session **2.2Email basics**, **mailx**: The universal mailer **2.3passwd**: Changing your password, **who**: Who are the users?, **uname**: Knowing your machine characteristics **2.4 tty**: Knowing your terminal, **stty**: Displaying and settingterminal characteristics	2.1 Execute General purpose commands. 2.2 Use of mailx command. 2.3 Display and change your terminal settings.	**6**	**CO2**
3	**Unit - III File Management in Linux** **3.1 The file**: Ordinary file, Directory file, Device file, Filename, The parent-child relationship, UNIX file system tree, TheUnix file system, The home directory **3.1.1pwd**: Checking your current directory, **cd**: Changing the current directory, **mkdir**: Making directories, **rmdir**: Removing directories, **ls:** Listing directory contents **3.2** Absolute pathnames, Relative pathnames **3.3** Handling ordinary files, **cat**: Displaying and creating files, **cp:** Copying file, **rm:** Deleting files, **mv:** Renaming files, **more:** Paging output **3.4The lp subsystem**: printing a file, file: knowing the file types **3.5 wc**: Counting lines, words and characters, **od:** Displaying data in octal, **cmp:** Comparing two files, **comm:** What is common?, **diff:** Converting one file to other **3.6 gzip and gunzip:** Compressing and decompressing files, **tar:**The archival program, **zip and unzip:** Compressing andarchiving together **3.7 rar and unrar**: to create and extract content from RAR archives. **3.8** Basic file attributes, **ls -l:** Listing file attributes, **the –doption:** Listing directory attributes **3.9 File ownership,** File permissions, **chmod:** Changing file permissions, directory permission,	3.1 Explain the file types. 3.2 Use absolute and relative pathnames. 3.3 Execute file and Directory commands. 3.4 Compress and archive files. 3.5 Execute basic file attributes. 3.6 Change file and directory permissions.	**6**	**CO3**

	Changing file ownership, **chown:** Changing file owner, **chgrp:** Changing group owner **3.9.1 System Administration**: **root-** Administrator's Login, **su-** Acquiring super user Status **3.9.2 User management** – user add, group add.			
4	**Unit - IV The vi Editor** **4.1 The vi Editor:** vi Command, Input, and Line Editing Modes. **4.2** Creating, Saving and Quitting a File in vi, Managing Editing Modes in vi. **4.3 vi Editing Commands:** Common Operations. **4.4 Navigation:** Movement in the four direction (h, j, k and l),Word navigation (b, e and w), Moving to Line extremes (0, |and $), Scrolling ([Ctrl-f], [Ctrl-b], [Ctrl-d] and [Ctrl-u],Absolute Movement (G) **4.5Searching for a pattern**(/ and ?), Repeating the last pattern search (n and N)	4.1 Create and modify files using the vi editor. 4.2 Use the line editing command. 4.3 Use then avigation command in vi editor. 4.4 Search a pattern in vi editor.	**4**	**CO4**
5	**Unit - V Filters, Regular Expressions** **5.1 Simple Filters:** The sample database, **pr:** Paginating files, **head:** Displaying the beginning of a file, **tail:** Displaying the end of a file, **cut:** Splitting a file vertically, **paste:** Pasting files, **cat :**to display file content **tac:** to display the file content in reverse order. **sort:** Ordering file, **uniq:** Locate repeated and non repeated lines, **tr:** Translating characters **5.2 Filters using regular expressions,** **grep:** Searching for a pattern, Basic regular expression (BRE)- An introduction, Extended regular expressions (ERE) and egrep. **sed:** The stream editor	5.1 Execute Linux filters. 5.2 Execute commands using regular expressions.	**4**	**CO5**
6	**Unit – VI Shell &Shell Programming** **6.1 The Shell:** The Shell's interpretive cycle, Shell offerings, Pattern matching: The wild-cards, Escaping and quoting, Redirection: The three standard files, /dev/null and /dev/tty: Two special files **6.2Pipes, tee:** Creating a tee, Common substitution, Shell Variables **6.3 Essential Shell programming, Shell scripts, read:** Making scripts interactive, Using command line arguments, exit and Exit status of command, The logical operators && and ||-Conditional executions **6.4The if conditional**, Using test and [ ] to evaluate expressions, the case conditional, **expr:** Computation and string handling, **$0:** Calling a script by different names **6.5 while:** Looping, **for:** Looping with a list until and for Statements.	6.1Explain the Shell's Interpretive Cycle. 6.2 Use of pattern matching and Wildcards. 6.3 Use of Shell variables 6.4Execute shell script programs.	**6**	**CO6**

E) PRACTICALASSESEMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of hrs.	Relevant COs
1.	Install the Linux Operating System	1.1 * Install and configure the Linux operating system.	**4**	**CO1**
2.	Execute general-purpose Linux commands.	2.1 * Execute the following general-purpose Linux commands. 1) cal 2) date 3)echo 4) printf 5) bc 6) script 7) mailx 8) man 9)clear	**2**	**CO2**
3.	Execute general-purpose Linux commands.	3.1 * Execute the following general-purpose Linux commands. 1) passwd 2) who 3)whoami 4) uname 5) tty 6) stty 7) ps 8) kill 9)sleep	**2**	**CO2**
4.	Execute file and Directory manipulation commands.	4.1 * Execute the following file and Directory manipulation commands along with different options. 1) pwd 2) cd 3) mkdir 4) rmdir5) ls 6) cat 7) rm 8) mv 9) cp	**2**	**CO3**
5.	Execute file and Directory manipulation commands.	5.1 * Execute the following file and Directory manipulation commands along with different options. 1) touch 2) more 3) lp 4) file 5)wc 6) cmp 7) comm 8) diff 9) split	**2**	**CO3**
6.	Execute Linux commands for compressing, decompressing, and archiving files.	6.1 * Execute the following Linux commands for compressing decompressing and archiving files.1) gzip 2) gunzip 3) tar 4) tar -c 5)tar -x 6) zip 7) unzip 8) rar 9) unrar	**2**	**CO3**
7.	Change file and directory permissions.	7.1 * Execute the following commands to change file and directory permissions. 1) ls -l, ls -ld 2) chmod (with all options) 3) chown 4) chgrp	**2**	**CO3**
8.	Create and manage Users and Groups	8.1 * Executing the following administrator and user management commands 1) Root 2) su3) user add 4) group add	**2**	**CO3**
9.	Use the vi editor to create and edit files.	9.1 * Use vi editor and execute all editor commands**.**	**2**	**CO4**
10.	Execute the filters commands in Linux.	10.1 * Execute the following filters commands in Linux. 1) pr 2) head 3) tail 4) cut 5)paste 6) cat 7) tac 8) sort 9) uniq 10) tr	**2**	**CO5**
11.	Execute filters commands in Linux.	11.1 * Execute commands grep, egrep and sed in Linux.	**2**	**CO5**
12.	Execute input and output redirection in Linux.	12.1 *Create input and output redirection in Linux.	**2**	**CO6**
13.	Execute shell scripts.	13.1 * Read user input, exit and exit status commands, expr, and logical operators in shell scripts.	**2**	**CO6**
14.	Execute the Shell script by using if statement and for loop	14.1 * Write the Shell script by using the “if" statement and for-loop.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Micro project

Not Applicable

Assignment

Not Applicable

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary components like; motherboard, random access memory(RAM), read-only memory (ROM), internal hard disk drives, Mouse, Keyboard, and open-source operating System. (Red Hat, Ubuntu etc.).	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Linux Operating System	CO1	4	-	-	-	-
2	II	General Purpose Utilities	CO2	6	-	-	-	-
3	III	File Management in Linux	CO3	6	-	-	-	-
4	IV	The vi Editor	CO4	4	-	-	-	-
5	V	Filters, Regular Expressions	CO5	4	-	-	-	-
6	VI	Shell and Shell Programming	CO6	6	-	-	-	-
Grand Total				**30**	**-**	**-**	**-**	-

I) ASSESMENT TOOL –

1) Formative assessment

Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering

1) 60% weightage is to process
2) 40% weightage to product

2) Summative Assessment

End Semester Examination, Lab Performance and Viva-voce.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No	Author	Title	Publisher with ISBN Number
1	Sumitabha Das	Unix Concepts and Applications	McGraw-Hill Education (India) Pvt Limited, 2006ISBN Number 978-0070635463
2	Richard Petersen	Linux The Complete Reference	McGraw Hill, 6th edition ISBN Number 978-0071492478
3	Richard Blum	Linux command line and shell scripting	Wiley India ISBN Number 978-1118983843
4	Prof. Dayanand Ambawade	Linux Lab: Hands on Linux	Dreamtech Press ISBN Number 9789350040003

- **WEBSITES LINKS**

Sr. No.	Link / Portal	Description
1	https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners	Linux Basic Commands
2	https://www.guru99.com/must-know-linux-commands.html	Linux Basic Commands
3	https://www.shellscript.sh/	Shell Scripts and Programs
4	https://www.tutorialspoint.com/unix/shell_scripting.html	Shell Scripts and Programs examples
5	https://spoken-tutorial.org/tutorial	Online Course

K) CO-PO Matrix –

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design / Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	2	3	1	-	3			1
CO2	3	-	1	3	1	-	3			1
CO3	3	-	1	3	1	-	3			1
CO4	3	2	2	3	1	-	3			2
CO5	3	2	2	3	1	-	3			2
CO6	3	2	2	2	1		3			2

Legends :- High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Web Page Designing
Course Code	R23CP6403
Course Category	SEC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	4	2	8	4	-	-	-	-	-	50	20	50@	20	25	10	125

Abbreviations:
CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning Assessment. Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Web page design provides a platform to express the digital world. The course combines creative and technical skills to develop online platforms such as web sites. This course introduces web page design using HTML5 and gives emphasis on learning Cascading Style Sheets (CSS) which is a style sheet language used for describing the presentation of a document written in a markup language for formatting and styling of content. The course outcome is practical oriented and will enable students to gain the skills and knowledge needed to create visually appealing, user-friendly, and optimized websites.

B) COURSE OUTCOMES (COs)

The students will be able to

1] Design simple web pages-using HTML
2] Link HTML pages and insert different lists
3] Integrate html pages, multimedia elements to develop websites
4] Organize information using Tables, Forms & Frames
5] Format web pages using CSS
6] Use website designing tools effectively.

D) COURSE CONTENTS

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**1.1 Introduction to Web Designing:** Internet, Client - Server architecture, W3C Standard, Website, Types of web sites, Web Browser, Web contents. **1.2 Introduction to HTML** Components of html: Tags, Elements, Attributes, Closed and open tags, Structure tags-<DOCTYPE>,<HTML>, <HEAD>,<TITLE>,meta tags,<BODY>elements. **1.3 BlockLevelElements:**Headings,Paragraphs,Breaks, Divisions,CenteredText,BlockQuotes,Preformattedtext,typesofAddress,HRtag.HorizontalRule. **1.4Text Level Tags:** Bold, em, Italic, Teletype, Underline, Strike through, Superscript, Subscript, DIV tag, displaying special characters, comments.	TLO1.1Differentiate Characteristics of the given type of web sites. TLO 1.2 State structure of The given HTML pages. TLO1.3Explainuseof Head tag and body tag in the given web page. TLO 1.4Explaintheprocedure of using the given block level tag on a webpage. TLO1.5Writetheprocedure of usin the given Text level tag and use of special characters in webpage.	**5**	**-**	**CO1**
2	**Lists and Linking HTML Documents** **2.1 Lists:** Ordered Lists, Unordered Lists, Definition Lists, Nested Lists. **2.1 Linking html Documents:** URLs, types of URLs- absolute URLs, relative URLs Linking html to specific location documents - The Anchor tag, Linking to document in same folder, Linking to document in different folder, Linking to document on the Web, Linking within document. Use of image as a link and email address as a link, nav tag, details tag.	TLO 2.1 Explain use of the given type of list in WebPages. TLO 2.2 Enlist different types of Links.	**5**	**-**	**CO2**
3	**Multimedia Elements** **3.1 Text and Image:** Color values, Color attribute off on ttag, bg color, border color. Image formats- gif, png, jpeg, bmp img tag, Formatting- alignment, height, and width, HSPACE and VSPACE, Wrapping Text, Image as a link, Image Map, Inserting image as page background. **3.2 Audio and Video**: Embedding sound files, animation, mpeg4 files, attributes.	TLO 3.1 Describe the given image attribute on a webpage and describe HSPACE&VSPACE TLO 3.2 Explain process of using the given colors/images as page back ground on a web page.	**4**	**-**	**CO3**
4	**Table, Frames and Forms** **4.1 Table:** Table – Table tags - table, tr, td, th. Rows and Columns settings- rowspan, colspan adding caption. Formatting table using attributes–display, border, border color, background, and align, width, no wrap, cellspacing, cellheight, cellpadding. **4.2 Frames and Forms:** **Frames**-Introduction to frames, creating Basic Frames, iframe, attributes-height, width, frame targeting. **Forms**-Creating Forms, Form elements and attributes- input, output, label, button, option, text	TLO4.1Explainthegiventableattributestoorganizedata on a web page and table setting. TLO 4.2Enlistdifferenttypesoftableattributes.TLO 4.3 Describe the given type of' frame' with examples and procedure to organize display as per given screen layout using frames. TLO 4.4 Create basic form using different form fields and Button tags.	**6**	**-**	**CO4**

	area, select button, field set, legend, data list, Password field, Radio buttons, Checkboxes, Reset and submit buttons.				
5	**HTML Styles** **5.1CascadingStyleSheets (CSS):**Different types of CSS- Inline, Internal, External, Benefits of using CSS, Setting CSS properties- Font, text, color, size, border, margin, Linking to CSS. **5.2CSS Advanced:** CSS Rounded Corners, CSS Border Images, CSS Shadows, CSS Text Effects, CSS2DTransforms, CSS 3D Transforms, CSS Transitions, CSS Animations, CSS Tooltips, CSS Style Images, CSS Image Reflection. **5.3 CSS Responsive:** RWD Intro, RWD Viewport, RWD Grid View, RWD Media Queries, RWD Images, RWD Videos, RWD Frameworks, RWD Template	TLO 5.1 Explain CSS code for the given type of formatting on a web page with different CSS properties. TLO 5.2 Write the procedure to create CSS for applying the given presentations on a webpage. TLO5.3EnlistdifferentCSS advanced properties.TLO5.4StatedifferenttypesofCSSresponsiveattributes.	**6**	**-**	**CO5**
6	**Web Site Designing Tools** **6.1 Open-Source Tools**: Photoshop-Image editing, painting with Photoshop, Adobe XP, and Procreate. **6.2WebsiteHosting:** HTTP - introduction, method, error codes, Web site Hosting - Basics, name servers, publishing websites, web site maintenance.	TLO 6.1Explaintheproceduretoconfigureaweb server and hosting the given website.	**4**	**-**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant COs
1	*Work with basic HTML tags.	LLO1.Createawebpageusing structure tags to display "CWIT, COMPUTER DEPARTMENT" message.	**2**	**CO1**
2	*Work on paragraph in webpage	LLO2.Createawebpageusingblock level and text level tags. Design a web page with two paragraphs each of 5-6 lines. Assign title to webpage. Practice formatting tags for bold, italics, underline, center, break, space, horizontal lines, spantag, pretag ,etc	**4**	**CO1**
3	*Implement the border properties in web page.	LLO3.Designawebpageusing structure, block level, text level tags with information about subjects learned (Include mathematical formulae).	**2**	**CO1**
4	*Work with ordered and unordered List.	LLO4.Designawebpagefor implementing ordered list and unordered list.	**2**	**CO2**
5	*Work on HTML web page link.	LLO5.CreateaWebpageusing hyperlinks to i) Same page	**4**	**CO2**

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant COs
		ii) Other page of same site iii) A Specific location on different web page of same site		
6	*Use of links in web page.	LLO6.Createawebpagetolink: i) An external page of different web site To ane-mail ID	**2**	**CO2**
7	*Insert image on web page foreground and background with various attributes	LLO7.Insertimageonwebpageusing various attributes and set image as background.	**2**	**CO3**
8	*Insert image with hyperlink and set image width and height property of image.	LLO8.Createawebpagecontainingany image and add a hyperlink to another webpage. Use width and height property For an image	**2**	**CO3**
9	*Work on multimedia elements.	LLO 9. Create a webpage containing multimedia elements.(Include audio and video elements)	**2**	**CO3**
10	*Work on HTML table in web page.	LLO10.CreateawebpageusingTable. (Include semester wise subjects)	**2**	**CO4**
11	*Create table within table and insert images in tables.	LLO11.Createawebpagethatdisplays semester time table. Make effective use of rows pan and colspan attributes. Make use of<th>tag.	**2**	**CO4**
12	Implement an ethical hacking technique in a controlled environment. (Any one type of Network hacking)	LLO12.Createawebpageto implement frame tags.	**2**	**CO4**
13.	Vulnerability Assessment in Capstone Project	LLO 13. Create a webpage that provides a form for filling personal information. The web page must contain following elements: • Textbox • Radio buttons • Checkboxes • Buttons(Submit/Reset) • Text area Text box for passwords	**4**	**CO4**
14.	Security Analysis in Real-Time Application Scenario	LLO 14. Create a web page for demonstration of CSS by applying internal style.	**4**	**CO5**
15.	*Create a CSS by applying in line style sheets.	LLO 15. Create a web page for demonstration of CSS by applying inline style.	**4**	**CO5**
16.	*Create a CSS by applying external style sheets.	LLO 16. Create a web page for demonstration of CSS by applying external style.	**4**	**CO5**
17.	*Create a web page and use transition properties of CSS to style the webpage.	LLO 17. Create a web page for demonstration of transitions in CSS.	**4**	**CO5**
18.	*Create a web page and style it using CSS animations.	LLO 18. Create a web page for demonstration of animations in CSS.	**4**	**CO5**
19.	*Work on RWD (Responsive Web Design)	LLO 19. Create a web page for		

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant COs
	templates in HTML	demonstration of CSS responsive web design.	**4**	**CO5**
20.	*Work on Photoshop	LLO 20. Import images in Photoshop and modify their colors, contrast, and tone in selected areas.	**4**	**CO6**
21.	Image editing on open-source tools.	LLO21.Createspecialeffectson images using open-source tools	**4**	**CO6**
22.	Hosting of website on open-source platform	LLO22.Createawebsiteandhoston open source.	**4**	**CO6**
23.	Create a website to represent portfolio	LLO23.Createawebpageto represent personal portfolio	**4**	**CO6**
24.	Integration of various tags, links, forms.	LLO24.CreateaWebsitebasedonany subject, theme or idea. (Include various tags, links, forms, multimedia elements,etc.)	**6**	**CO6**

Note: Out of above suggestive LLOs-

- '*'Marked Practical's (LLOs) are mandatory.
- Minimum 80% of above list of lab experiments are to be performed.
- Judicial mix of LLOs is to be performed to achieve desired out comes.

F) SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/SKILLS DEVELOPMENT(SELFLEARNING)

Self-Learning

Following are some suggestive self-learning topics or similar self-learning topics could be added by the concerned faculty:

• Create a multimedia application which includes audio/video playlist, animation.

• Create a website which includes photo albums with caption.

• Create a website of travel destination guide.

Micro project

• The micro project has to be industry based application, internet-based, workshop-based, laboratory-based or field-based or as suggested by Teacher.
• Create a music library or music store web page. Create a music page to include an appropriate background image and brief description contents. Different menus along with the list of songs according to attributes like genre, year, singer, album etc. can be included at the header part of the page. Also create registration form link.
• Design an Event Webinar web page. The event page will include event location with image, photographs style as per the web page, list of speakers in the header section. Divide the page into smaller sections. Apply appropriate background color, font etc.
• Develop any other website of Student's / Faculty's Choice.

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G) LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

Sr.No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	• Computer system with all necessary peripherals and internet connectivity. • Any Office Software • Any browser	ALL

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Tota lMarks
1	I	Introduction to HTML	CO1	5	0	0	0	0
2	II	Lists and Links	CO2	5	0	0	0	0
3	III	Images, Colours and Background	CO3	4	0	0	0	0
4	IV	Table, Frames and Forms	CO4	6	0	0	0	0
5	V	Cascading Style sheets	CO5	6	0	0	0	0
6	VI	Website Hosting	CO6	4	0	0	0	0
Grand Total				**30**	**00**	**00**	**00**	**00**

I) ASSESMENT TOOL –

- **Formative assessment**

1) Continuous assessment based on process and product related performance indicators

- **Summative Assessment**

1) End semester examination(Lab. performance), viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title	Author	Publisher with ISBN Number
1	HTML and CSS Complete Reference	Thomos Powell	TataMcGrawHill,ISBN-978-0-07-174170-5
2	Web Publishing with HTML and CSS	Lemay Colburn	Pearson,ISBN-13:978-0-672-33623-2
3	Kogent Learning Solutions Inc.	HTML5BLACK BOOK	Wiley India Pvt. Limited,ISBN-9789350040959,9350040956

- **WEBSITES LINKS**

Sr. No	Link / Portal	Description
1	https://www.geeksforgeeks.org/	Designing web page, Introduction of html
2	https://www.w3schools.com/html/html_blocks.asp	Block Level Tag
3	https://www.javatpoint.com/html-frame-tag	Frames in HTML
4	https://www.w3schools.com/css/default.asp	CSS Style sheet, CSS Advanced

K) CO-PO Matrix –

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO 1	1	-	-	1	-	1	-	-	-	-
CO 2	1	-	1	1	1	2	-	-	-	-
CO 3	1	-	2	1	1	2	-	-	-	-
CO 4	1	1	2	1	1	3	-	-	-	-
CO 5	2	2	2	1	3	3	-	-	-	-
CO 6	3	2	2	2	3	3	-	-	2	-

Legends: -High:03,Medium:02,Low:01,No Mapping -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Professional Communication
Course code	R23CP6701
Course Category	SEC
Credits	1

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	2	-	2	1	-	-	-	-	-	25 @	10 @	25@	10 @	-	-	50

ABBREVIATIONS:
Legends: @ Internal, # External, *# Online Examination, @$ Internal Online Examination
Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA- Formative Assessment, SA-Summative Assessment, IKS: Indian Knowledge System, SLA- Self Learning Assessment.

A) RATIONALE:
Communication is the life blood of any business. To be able to communicate effectively is considered one of the foremost employability skills. Fluency and correct pronunciation makes a world of difference in any business situation like meetings, conferences, seminars, presentations etc. Along with that, a business professional has to be proficient in written communication. Hence in this curriculum, speaking and writing skills are emphasized to help the students in interviews, presentations, and other oral as well as written communication situations.

B) EXPECTED SKILLS
Communicate effectively at the workplace

C) COURSE OUTCOMES:
1. Communicate effectively in various formal and informal situations minimizing the barriers.
2. Develop listening skills through active listening and note taking.
3. Face a mock interview.
4. Draft enquiry letter, complaint letter, Job application with resume / CV
5. Write a leave application, request and apology letter.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Unit No. 1 Professional Communication : An Overview** 1.1 Definition of professional communication- Importance, relevance,	1.1 Use different types of verbal and non–verbal communication during a presentation	-	-	CO1

	Elements and process of communication 1.2 7 C's of Professional Communication (Clarity, Conciseness, correctness, Coherent, concrete, courteous and Complete) Effective professional Presentation Skills for business				
2	**Unit No. 2 – Listening & Note Taking** 2.1 Difference between listening & Hearing 2.2 Types of listening a. Active listening b. Passive listening c. Selective listening 2.3 Techniques of Note taking , Types of note taking (Outline notes, Mind Mapping, Flowcharts)	2.1 state the difference between listening and hearing 2.2 Explain active listening, passive listening and selective listening 2.3 Take notes using appropriate methods	-	-	**CO2**
3	**Unit No. 3 – Interview Techniques** 3.1 Preparation stage: Preparing for an interview, pre-interview research. 3.2 Factors affecting performance during the interview: stress, self-awareness, presence of mind. 3.3 Post-interview follow-up	3.1 Face a mock interview using appropriate communication skills	-	-	**CO3**
4	**Unit No. 4 – Writing Skills-1** 4.1 Enquiry letter 4.2 Complaint letter	4.1 Draft formal letters related to employment in given situations.	-	-	**CO4**
5	**Unit No. 5 – Writing Skills-2** 5.1 Letter of job application 5.2 Resume writing	5.1 Draft formal letters related to employment in given situations.	-	-	**CO4**
6	**Unit No. 6 – Writing Skills-3** 6.1 Leave application 6.2 Apology letter 6.3 Request letter	6.1 Draft formal letters related to employment in given situations.	-	-	**CO5**

E) PRACTICAL (BASED ON LL & TL) ASSESSMENT WORK

S. No.	CO	Practical Exercises (Outcomes in Psychomotor Domain)	Language Skills required			
			Listen	Speak	Read	Write
1	CO1	Elocution (Impromptu speech)		✓		
2	CO1	Debate	✓	✓		
3	CO1	Group Discussion	✓	✓		
4	CO3	Mock Interview	✓	✓	✓	
5	CO1	PowerPoint Presentation	✓	✓	✓	✓
6	CO1	Poster Presentation	✓	✓	✓	✓
7	CO1	Role Play	✓	✓	✓	
8	CO2	Listen to a speech in English and summarize the contents	✓	✓		

9	CO2	Listen to a news report or a podcast in English and summarize the contents	✓	✓		
10	CO2	Listen to a story in English and narrate the same story with appropriate body language /voice modulation techniques.	✓	✓		
11	CO1	Read a newspaper article/editorial and summarize the contents		✓	✓	✓
12	CO5	Write a letter to the Principal of your institute on a given situation				✓
13	CO4	Write a letter to the warden/ incharge of your hostel on a given situation				✓
14	CO5	Write a letter of leave application to your Head of the Department/subject teacher.				✓
15	CO5	Write an apology letter to the Hod/subject teacher on a given situation				✓
16	CO5	Write a letter to the librarian on a given situation.				✓
17	CO4	Write a job application letter [attach your résumé]				✓
18	CO1	Read a chapter of a famous book and narrate the same to your teacher. Write the summary in your file.		✓	✓	✓
Note: Any **12 out of 18** assignments are compulsory. At least one assignment is compulsory on each CO.						

F) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT,ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) [Any One]

NOT APPLICABLE

G) LABORATORY LEARNING EQUIPMENTS REQUIRED

1. Language laboratory with latest software
2. LCD –Projector
3. Smart Board

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE: (Specification Table)

NOT APPLICABLE

I) ASSESSMENT TOOL

- **Formative assessment**

1. FA-PR (Term Work)

- **Summative Assessment**

1. SA-PR (Oral Exam of 25 marks)

J) LEARNING RESOURCES

- **Books**

S. N.	Title of Book	Author	Publication
1	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press ISBN 9780199457069
3	Communication Skills	MSBTE Textbook	MSBTE

4	Effective communication Skills	Robert King	Audio book -ISBN 978181667009742
5	English for Technical Communication	N P Sudharshana , C Savitha	Cambridge-ISBN 978-13-16640-08-1
6	Communication Skills for Engineers	C. Murlikrishna , Sunita Mishra	Pearson - ISBN 978-81-317-3384-4
7	Business Communication	R. C. Bhatia	Ane Books India,New Delhi.
8	Kumar's Group Discussions and Interviews	Dr. B. R. Kishore , D. S. Paul	Vee Kumar Publications Private Limited,New Delhi-110008.
9	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press
10	PowerPoint Presentations that Sell	Adam B. Cooper	McGraw Hill Professionals

- **SOFTWARES/TOOLS/MODELS**

. Latest online resources, apps etc.

. Language laboratory resources.

- **WEBSITES LINKS**

S. No.	Address
1	https://www.britishcouncil.in/english/online
2	https://learnenglish.britishcouncil.org/english-levels/online-english-level-test
3	https://www.talkenglish.com/
4	http://www.wordsworthelt.com
5	http://www.notesdesk.com
6	http://totalcommunicator.com/
7	http://www.speaking-tips.com
8	http://www.skillstudio.co.uk
9	http://www.mindtools.com
10	http://www.storynory.com
11	http://www.makeuseof.com
12	https://www.coursera.org
13	https://www.udemy.com
14	https://swayam.gov.in/
15	https://unacademy.com/
16	https://lanquill.com/

K) CO-PO MATRIX

Course Outcomes (COs)	PO 1 Basic & discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools	PO 5 Engineering practice for society, sustainability and environment.	PO 6 Project management	PO7 Lifelong learning	PSO 1	PSO 2	PSO3
CO1	0	1	0	0	1	1	0	0	0	1
CO2	0	0	0	0	0	1	0	2	1	0
CO3	0	0	0	0	0	1	0	0	0	2
CO4	0	0	0	0	0	1	0	0	0	3
CO5	0	0	0	0	0	1	0	0	0	1

Legends: -High:03,Medium:02,Low:01,No Mapping –

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Social and Life Skills
Course Code	R23CP4401
Course Category	VEC
Credits	1

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
							FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

A social and life skills course equips a student with the tools to navigate the complexities of everyday life and build positive relationships. This course provides a foundation for success in all aspects of life. By developing these essential competencies students can thrive in their personal and professional endeavours. Learning of social and life skills will provide students with essential attitudes and values that will prepare them for future.

B) EXPECTED SKILLS –

Demonstrate ethics, social and life skills in day to day situation.

C) COURSE OUTCOMES (COs)

CO1: Develop self awareness and self confidence...
CO2 : Demonstrate social and moral values in personnel and professional life
CO3 : Demonstrate awareness about environment and take steps to preserve it .
CO4 : Apply emotional intelligence in everyday situation.
CO5 : Set appropriate life goals by managing stress and time effectively.
CO6 : Apply basic financial knowledge in daily life.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**Introduction to Social and Life skills** 1.1Meaning and concepts of social and life skills. 1.2 Importance of social and life skills for personal and professional success 1.3 Self assessment and identifying areas for development	To demonstrate appropriate social and life skills in one's personal and professional life	-	-	CO1
2	**Value Education** 2.1 Importance of value education in personal and professional settings 2.2 Identifying personal values and goals. 2.3 Value education through case study.	To demonstrate moral and social values in personal and professional life.	-	-	CO2
3	**Environmental Awareness** 3.1 Awareness about basic elements of environment 3.2 Cause and Effect of present environmental situation and problems 3.3 Preparation of Action plan at individual level to solve environmental issues.	To demonstrate awareness about environmental issues and take steps to solve it.	-	-	CO3
4	**Managing one Self** 4.1 Introduction to emotional intelligence (EQ) concepts. 4.2 Identifying and managing ones positive and negative emotions.	To Identify and Manage ones positive and negative emotions.	-	-	CO4
5	**Managing ones social life** 5.1 Stress Management 5.2 Time Management 5.3Critical thinking and problem solving skills	To handle ones stress and time effectively to achieve ones social and life goals.	-	-	CO5
6	**Basics of Financial Literacy** 6.1 Concept of saving , investment and banking 6.2 Identifying ones financial needs 6.3 Setting ones financial goals	To implement basic financial knowledge in one's daily life.	5	-	CO6

E) Assignments for SLA

Note: Perform **any 10** of the following Assignments and Submit the assignments in Institute file.

SR.NO.	NAME OF THE ASSIGNMENT	Total Marks	CO
1.	Prepare a **poster** [handmade or using graphic design tool] on any **ONE** of the given topics: • Climate Change • Water Management • Energy management • Waste management • Biodiversity conservation • Gender Equality	5	CO3
2.	Prepare a **Report** on any One of the above theme/topic. The report must include the following points: Introduction, Causes of the problem, Present situation, Effects of the problem, Solution, Action Plan for the future	5	CO3
3.	**Social Activity** Submit proof[certificate/photographs] on **any One** of the following event that you have attended or participated in: • Helping the needy • Blood Donation • Tree Plantation • Helping the elderly people in your neighbourhood • Any other social activity	5	CO2
4.	Prepare a **Presentation using AI Tools** on Global Warming/ Harmful Effects of Social Media/ Financial Planning/Gender Equality	5	CO3 CO6
5.	Prepare a one minute **reel/video** [any language] on the importance of water conservation	5	CO3
6.	**Visit** to orphanage/ social organisation to create awareness about the importance of helping the needy /social responsibility and submit report.	5	CO2
7.	**Interview** a Social Worker/Financial Expert/ your Role Model in your family or your neighbourhood. Attach relevant photographs /reel/video of the interview	5	CO1, CO2 CO6
8.	**Your Action plan** on Stress Management/Time Management during exams and stressful situations. List down the physical, mental, spiritual activities that you have performed for your overall well being	5	CO5
9.	**Prepare your SWOT Analysis** that leads to development of your Critical Thinking & Problem solving Skills	5	CO5
10.	Write a Report about your contribution in the **Cleanliness Drive in** your institute and your neighbourhood	5	CO2
11.	**Interpret the readings** of your residence Electricity Bill/ Water Bill/ House Maintenance/ Property Tax / Product Purchase Bill to your family members and write a report.	5	CO6
12.	**Enlist the process in the form of flowchart** of opening a bank account in any bank	5	CO6

F) LABORATORY LEARNING EQUIPMENTS REQUIRED –
Not Applicable

G) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

H) ASSESMENT TOOL –

- **Formative assessment**
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- **Summative Assessment**

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I) LEARNING RESOURCES –

- **BOOKS**

Sr No.	BOOK	Author	Publisher with ISBN Number
1.	Life skills in contemporary education system	Pooja Gupta	Nova Science Publishers ISBN: 979-8-88697-704-2
2.	Life skill education	Gourav Mahajan	Kaveri Book Publishers ISBN-10 : 9388691830 ISBN-13 : 978-9388691833
3.	Manual on Water Supply and Treatment	Central Public Health and Environmental Engineering Organisation	Ministry of Urban Development, New Delhi
4.	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Specifications And Standards Committee	Bureau of Indian Standards and The Indian Road Congress

- **SOFTWARE/ TOOLS/ MODELS**
  AI tools for Presentation
- **WEBSITES LINKS**
  1. https://lifeskillscollaborative.in/
  2. https://propertytax.punecorporation.org/onlinepay/prop_dues_details.aspx
  3. https://inbreakthrough.org/campaign/championing-life-skills-for-indias-young-people/
  4. https://wss.mahadiscom.in/wss/wss?uiActionName=getViewPayBill
  5. https://wwwcmcaindia.org/
  6. https://www.magicbus.org/life-skills-ducation.php

K) CO-PO-PSO Matrix –

Course Outcomes (Cos)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	-	2	-	-	2
CO2	-	-	-	-	2	1	1	-	-	2
CO3	-	-	-	-	3	-	1	-	-	1
CO4	-	-	-	-	-	2	1	-	-	2
CO5	-	-	-	-	1	1	2	-	-	2
CO6	-	1	-	-	1	1	1	-	-	1

Legends: - High:03, Medium:02, Low:01, No Mapping: -

Modern Education Society's

Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses MPECS R23 (Based on National Education Policy 2020)

PROGRAMME NAME: DIPLOMA IN COMPUTER ENGINEERING

PROGRAMME CODE:CO	**WITH EFFECT FROM ACADEMIC YEAR: 2023-24**
DURATION OF PROGRAMME: 6 Semesters	**EXIT SCHEME - FIRST YEAR**
YEAR EXIT: NCrF LEVEL 3.5	**SCHEME: R23**

Sr. No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for sem.	Learning Scheme					Credits	Assessment Scheme												
						Actual Hrs./Week			Self-Learning (Assignment/ Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				(Based on LL & TL)				Based on Self Learning		Total Marks
																	Practical						
													FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
						CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(All Compulsory)																								
1	**WEB PAGE DESIGNING**	**WPD**	**SEC**	**R23CP6403**	**0**	**2**	**-**	**4**	**2**	**8**	**4**	**-**	**-**	**-**	**-**	**-**	**50**	**20**	**50@**	**20**	**25**	**10**	**125**
2	**EXIT- INTERNSHIP 01**	**EII**	**INP**	**R23CP5403**	**0**	**-**	**-**	**-**	**-**	**0**	**4**	**-**	**-**	**-**	**-**	**-**	**25**	**10**	**25@**	**10**	**-**	**-**	**50**
TOTAL					**0**	**2**	**0**	**4**	**2**	8	**8**	**-**	**-**	**-**	**-**	**-**	**75**		**75**				**175**

Abbreviations :

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note:

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) :
Skill Enhancement Course (SEC): , Generic Elective (GE) :

SEMESTER III

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Data structure
Course code	R23CP2402
Course Category	DSC
Credits	**4**

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This course is a continuation of 'Programming in C' course, and provides students an opportunity to further develop and refine their programming skills. In particular, the emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs. It also explores the close relationship between data structures and algorithms. Student also considers complexity of algorithm while developing program logic.

B) EXPECTED SKILL/s –

Implement algorithm using relevant Data Structures.

C) COURSE OUTCOMES (COs) –

Students will be able to achieve & demonstrate the following COs on completion of course based learning.

1. Perform basic operations on Arrays.
2. Apply different Searching and sorting methods.
3. Implement basic operations on Linked List.
4. Perform operations on Stack using Array and Linked List Implementations.
5. Perform operations on Queue using Array and Linked List Implementations.
6. Create and Traverse Tree to solve problems.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1.	**Introduction to Data Structures:** **Introduction**: Concept and Need of Data Structure, Definition ,Abstract Data Type Types of Data Structures : (i)Linear Data Structures (ii)Non-Linear Data Structures Operations on Data Structures: (i)Traversing (ii) Insertion (iii)Deletion	**TLO 1.1** Classify the given type of Data Structures based on their characteristics and space. **TLO 1.2** Perform operations on the given type of Data Structure.	**4**	**10**	**CO1**
2.	**Searching and Sorting** Searching: Searching for an item in a data set using the following methods: (i) Linear Search (ii) Binary Search Sorting: Sorting of data set in an order using the following methods:(i) Bubble Sort (ii) Selection Sort (iii) Insertion Sort (iv) Quick Sort (v) Merge Sort	**TLO 2.1** Develop algorithm to search the given key using different searching techniques. **TLO 2.2** Create algorithm to sort data using a given method. .	**8**	**10**	**CO2**
3.	**Linked List** **Difference between Static and Dynamic Memory Allocation, Introduction to Linked List** **Terminologies:** Node ,Address ,Pointer ,Information Field / Data Field ,Next Pointer ,Null Pointer ,Empty List **Types of Lists**: Linear List ,Circular List ,Representation of Doubly Linked List **Operations on a Singly Linked List:** Creating a Linked List ,Inserting a New Node in a Linked List ,Deleting a Node from a Linked List ,Searching a Key in a Linked	**TLO 3.1** Differentiate between Static and Dynamic Memory Allocation. **TLO 3.2** Create a suitable structure using a Linked List to represent a Node. **TLO 3.3** Create algorithm to add or remove a specified item from a Linear Linked List.	**10**	**15**	**CO3**

	List ,Traversing a Singly Linked List . **Applications of Linked List**				
4.	**Stack** **Introduction to Stack :** Definition, Stack as an ADT (Abstract Data Type) **Operations on Stack** : Push, Pop **Stack Operation Conditions** : Stack Full / Stack Overflow, Stack Empty / Stack Underflow **Stack Implementation** : Implementation using Array, Representation using Linked List **Applications of Stack** : Reversing a List, Polish Notations, Conversion of Infix to Postfix Expression, Evaluation of Postfix Expression **Recursion** : Definition and Application	**TLO 4.1** Represent Stack using Array and Linked List. **TLO 4.2** Create algorithm to carry out the PUSH and POP operations in a Stack. **TLO 4.3** Use Stack to transform the given expression from Infix to Postfix. **TLO 4.4** Evaluate Postfix Expression.	**8**	**10**	**CO4**
5.	**Queue** **Introduction to Queue** : Queue as an ADT, Queue representation in memory using Array and representation using a Linked List. **Types of Queues** : Linear Queue, Circular Queue, Concept of Priority Queue, Double-Ended Queue. **Queue Operations** : Insert, Delete. **Queue Operation Conditions** : Queue Full, Queue Empty. **Applications of Queue.**	**TLO 5.1** Represent Queue using Array and Linked List. **TLO 5.2** Explain the Characteristics of different types of Queue. **TLO 5.3** Create algorithm to carry out the INSERT and DELETE operations on a Queue.	**6**	**10**	**CO5**
6.	**Tree** **Introduction to Trees** **Terminologies**: Tree, Degree of a Node, Degree of a Tree, Level of a Node, Leaf Node, Depth / Height of a Tree, In-Degree and Out-Degree, Path, Ancestor and Descendant Nodes. **Tree Types and Traversal Methods.** **Types of Trees**: General Tree, Binary Tree, Binary Search Tree (BST).	**TLO 6.1** Describe the given Tree Terminology. **TLO 6.2** Create a Binary Search Tree based on the provided data. **TLO 6.3** Create algorithms to traverse the Tree using the given method. **TLO 6.4** Create an Expression Tree. **TLO 6.5** Create Heap. .	**9**	**15**	**CO6**

	Binary Tree Traversal: In-Order Traversal, Preorder Traversal, Post-Order Traversal. **Expression Tree, Heap.**				

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	*Write a 'C' Program to perform following operations on Array : Create, Insert, Delete, Display.	**LLO 1.1** Implement Array Operations.	4	**CO1**
2.	Write a 'C' Program to search a particular data from the given Array of numbers using Linear Search Method.	**LLO 2.1** Implement Linear Search Method on Numbers	2	**CO2**
3.	*Write a 'C' Program to search a particular data from the given Array of Strings using Linear Search Method.	**LLO 3.1** Implement Linear Search Method on Strings.	2	**CO2**
4.	*Write a 'C' Program to search a particular data from the given Array of numbers using Binary Search Method.	**LLO 4.1** Implement Binary Search Method on Numbers.	2	**CO2**
5.	Write a 'C' Program to search a particular data from the given Array of Strings using Binary Search Method.	**LLO 5.1** Implement Binary Search Method on Strings.	2	**CO2**
6.	*Write a 'C' Program to sort an Array of numbers using Bubble Sort Method.	**LLO 6.1** Apply Bubble Sort Method for Sorting Numbers.	2	**CO2**
7.	Write a 'C' Program to sort an Array of Strings using Bubble Sort Method.	**LLO 7.1** Apply Bubble Sort Method for Sorting Strings	2	**CO2**
8.	*Write a 'C' Program to sort an Array of numbers using Selection Sort Method.	**LLO 8.1** Apply Selection Sort for Sorting Numbers	2	**CO2**
9.	Write a 'C' Program to sort an Array of Strings using Selection Sort Method.	**LLO 9.1** Apply Selection Sort for Sorting Strings	2	**CO2**
10.	*Write a 'C' Program to sort an Array of numbers using Insertion Sort Method.	**LLO 10.1** Apply Insertion Sort for Sorting Numbers	2	**CO2**

11.	Write a 'C' Program to sort an Array of Strings using Insertion Sort Method.	**LLO 11.1** Apply Insertion Sort for Sorting Strings	2	**CO2**
12.	*Write a 'C' Program to implement Singly Linked List with operations (i) Insert at beginning, (ii) Search, (iii) Display.	**LLO 12.1** Create Singly Linked List	2	**CO3**
13.	*Write a 'C' Program to implement Singly Linked List with operations : (i) Insert at end, (ii) Insert After, (iii) Delete,(iv) Display.	**LLO 13.1** Perform Given Operations on Singly Linked List	2	**CO3**
14.	Write a 'C' Program to create two Polynomials using a Linked List.	**LLO 14.1** Create Polynomials using Linked List	2	**CO3**
15.	*Write a 'C' Program to add two Polynomials using a Linked List.	**LLO 15.1** Perform the Addition of Two Polynomials using a Linked List	2	**CO3**
16.	*Write a 'C' Program to perform PUSH and POP operations on Stack using an Array.	**LLO 16.1** Perform Operations on the Stack using the Array	2	**CO4**
17.	*Write a 'C' Program to perform PUSH and POP operations on Stack using a Linked List.	**LLO 17.1** Perform Operations on the Stack using a Linked List	2	**CO4**
18.	*Write a 'C' Program to perform multiplication of two numbers using Recursion.	**LLO 18.1** Apply Recursive Procedure to Multiply Two Numbers	2	**CO4**
19.	Write a 'C' Program to print a given string in reverse using Recursion.	**LLO 19.1** Apply Recursive Procedure to Reverse the String	2	**CO4**
20.	Write a 'C' Program to create a Singly Linked List and traverse in reverse order using Recursion.	**LLO 20.1** Apply Recursive Procedure to Display Linked List in Reverse	4	**CO3,CO4**
21.	*Write a 'C' Program to perform INSERT and DELETE operations on Linear Queue using an Array.	**LLO 21.1** Perform Operations on Linear Queue using Array	2	**CO5**
22.	*Write a 'C' Program to perform INSERT and DELETE operations on Linear Queue using a Linked List.	**LLO 22.1** Perform Operations on Linear Queue using Linked List	2	**CO5**
23.	*Write a 'C' Program to perform INSERT and DELETE operations on Circular Queue using an Array.	**LLO 23.1** Perform Operations on Circular Queue using Array	2	**CO5**
24.	Write a 'C' Program to perform INSERT and DELETE operations on Circular Queue using a Linked List.	**LLO 24.1** Perform Operations on Circular Queue using a Linked List	2	**CO5**

25.	Write a 'C' Program to create a Priority Queue using a Linked List.	**LLO 25.1** Implement Priority Queue using Linked List	4	**CO5**
26.	*Write a 'C' Program to implement BST (Binary Search Tree) and traverse in In-Order.	**LLO 26.1** Implement Binary Search Tree and Perform In-Order Traversal	2	**CO6**
27.	Write a 'C' Program to traverse BST in Preorder and Post-Order.	**LLO 27.1** Implement Tree Traversal Operations	2	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

1. **Read and Understand Basic Data Structures**

   • **Topic:** Arrays, Linked Lists, Stacks, Queues, Trees, Graphs, Heaps, Hash Tables.
   • **Activity:** Read textbooks, watch video lectures, or online tutorials to understand the definitions, properties, and applications of each data structure.

2. **Implement Data Structures**
   - **Topic:** Implement basic data structures in a programming language.
   - **Activity:** Write code to implement common data structures like arrays, linked lists, stacks, queues, binary search trees, etc.
   - **Languages:** C.
   - **Example:** Create a singly linked list, implement stack and queue using arrays or linked lists.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer System with all necessary Peripherals and Internet Connectivity. 'C' Compiler / GCC Compiler / Online 'C' Compiler.	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to Data Structures	4	5	5	--	10
2.	Searching and Sorting	8	3	3	4	10
3.	Linked List	10	5	5	5	15
4.	Stack	8	3	3	4	10

5.	Queue	6	3	3	4	10
6.	Tree	9	5	5	5	15
	TOTAL	**45**	**45**	**24**	**24**	**22**

I) ASSESMENT TOOL –

1) Formative assessment

1) Continuous Assessment based on Process and Product related Performance Indicators.
2) Each practical will be assessed considering 60% weightage to Process and 40% weightage to Product.

2) Summative Assessment

1) End semester Examination , Lab performance ,Viva-Voice

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1.	Lipschutz	Data Structures with C (SIE) (Schaum's Outline Series)	McGraw Hill Education, New Delhi, ISBN: 978-0070701984
2.	Balagurusamy, E	Data Structures using C	McGraw Hill Education, New Delhi, 2013, ISBN: 978-1259029547
3.	ISRD Group	Data Structures using C	McGraw Hill Education, New Delhi, 2013, ISBN: 978-1259006401
4.	Yashwant Kanetkar	Understanding Pointers in C	BPB Publications, ISBN: 8170298911

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	https://www.javatpoint.com/data-structure-introduction
2.	https://www.geeksforgeeks.org/introduction-to-data-structures/
3.	https://studytonight.com/data-structures/
4.	https://www.tutorialspoint.com/data_structures_algorithms/
5.	https://www.w3schools.in/data-structures/
6.	https://www.mygreatlearning.com/blog/data-structure-tutorial -for-beginners/
7.	https://byjus.com/gate/introduction-to-data-structure-notes/

Note:

- Teachers are requested to check the Creative Commons license status / financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	1	-	-	1
CO2	2	2	2	1	-	-	1	-	-	1
CO3	2	2	2	1	1	1	1	-	-	1
CO4	2	2	2	1	-	1	1	-	-	1
CO5	2	2	2	1	-	1	1	-	-	1
CO6	2	2	2	1	-	1	1	-	1	1
Legends: - High:03, Medium:02, Low:01, No Mapping: -										

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Object Oriented Programming With C++
Course code	R23CP6404
Course Category	SEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	6	3	3	30	40	100	40	25	10	25@	10	25	10	175

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# OnLineExamination, @$ Internal Online Examination

A) RATIONALE

Object oriented programming is now used for most software projects. Object oriented programming offers a new and powerful way to cope with complexity. Among the Object oriented programming languages available C++ is most widely used language. This subject acts as a foundation for languages like JAVA, C++.

B) EXPECTED SKILL/s –

Develop applications using concepts of OOP in C++

C) COURSE OUTCOMES (COs)

1. Understand basic concepts of OOP languages – tokens, Operators, Expressions and Control Structures in C++.
2. Define class, objects, use of static variables, friend functions.
3. Develop C++ programs using constructors and destructors.
4. Implement different types of inheritances and use of exception handling
5. Use of pointers, Implement polymorphism concept, its types.
6. Use console I/O and perform file operations using streams.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Unit - I Principles of Object Oriented Programming** 1 Object Oriented Programming Paradigm, Basic concepts of OOP, Benefitsof OOP, Object Oriented Languages, and Applications of OOP and Procedure Oriented Programming (POP) verses Object Oriented Programming (OOP). 2 **Beginning with C++:** What is C++?Applications of C++, Simple C++ program- Program features, comments, output operator, the iostream file, namespace, return type of main (), variables, input operator, cascadingof I/O operators, Structure of C++ program. 3 **Tokens**: Tokens, keywords, identifiers and constants, Data types-basic datatypes, derived atatypes, symbolic constants. Declaration of variables, Dynamic initialization of variable, Reference variables. **1.4 Operators, Expressions and Control Structures in C++:** Operators in C++, Scope resolution operator, Member referencing operators, Memory management operators, Manipulators, typecast operator. Expression and their types, Operator precedence. Control Structures: Sequence Structure, Selection Structure (if, if-else, switch) , Loop Structure (do-while, while and for)	TLO 1.1 Compare POP vs OOP approach of programming. TLO 1.2 Understand fundamental concepts of object oriented languages and its features. TLO 1.3 Write programs using arithmetic and special operators in C++. TLO 1.4 Write programs using control structure in C++.	**8**	**10**	**CO1**

2	**2.1 Functions in C++:** The main Functions, function prototyping, call by Reference, return by reference, inline functions, default arguments, const arguments, function overloading. **2.2 Classes& Objects**: Introduction, specifying a class– a simple class example, creating objects, accessing class members. Defining member functions: Outside the class definition, Inside the class definition. A C++ program with class, making an outside function inline, nesting of member function, private member functions, Memory allocations for objects. Static data members, Static member functions, array of Objects, Objects as function arguments, friendly functions, returning objects, const member functions.	TLO 2.1 Develop C++ program to show the use of Classes and Objects. TLO 2.2 Develop a program using inline functions and friend functions. TLO 2.3 Write C++ programs using array of objects. TLO 2.4 Write C++ programs using Static data members, Static member functions, array of Objects, Objects as function arguments.	**9**	**15**	**CO2**
3	**3.1 Constructors and Destructors:** Introduction, Constructors, Parameterized constructors, multiple constructors in a class, constructor with default arguments, dynamic initialization of objects, Copy Constructor, Dynamic constructors, Destructors **3.2 Operator Overloading –** Introduction, defining operator overloading, overloading unary operators, overloading binary operators, rules for operator overloading.	TLO 3.1 Write C++ program to initialize the object using appropriate constructor. TLO 3.2 Write C++ program to delete object using destructor. TLO 3.3 Write C++ program using unary and binary operator overloading..	**7**	**10**	**CO3**

4	**4.Inheritance:** Introduction, Defining Derived classes, Single Inheritance, Making private members inheritable (Visibility modes), Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance. **4.2**Virtual Base Classes, Abstract Classes, Constructors in derived classes **4.3 Exception Handling:** Introduction, Basics of Exception Handling, Exception handling mechanism, throwing mechanism, catching mechanism - Multiple catch statements, catch all exceptions, Rethrowing an Exception.	TLO 4.1Explain the different types of inheritance TLO 4.2 Implement the given type of inheritance in C++ program. TLO 4.3 Write C++ program using virtual base class. TLO 4.4 Use constructors in given derived class. TLO 4.5Implement the Exception Handling concepts	**7**	**15**	**CO4**
5	**5.1 Pointers and Polymorphism:** Introduction, Pointers: - Declaring and initializing pointers, Manipulation of pointers. Pointer to objects, this pointer. **5.2 Polymorphism**: Introduction, Compile-time polymorphism, Need for Run-time polymorphism. Pointers to derived classes, Virtual functions and Pure Virtual functions**,** Virtual constructors and destructors.	TLO 5.1 Use of pointers TLO 5.2 Describe Polymorphism. TLO 5.3Use 'pointer to object' to solve the given problem. TLO 5.4 Use compile time and run time polymorphism to solve the given problem. .	**6**	**10**	**CO5**
6	**6.1 Console I/O Operations:** Introduction, C++ streams, C++ streamsclasses.	TLO 6.1 Implement I/O basic operations.	**8**	**10**	**CO6**

	Unformatted I/O operations- put (), and get () functions, getline() and write() functions. Formatted Console I/O operations – Introduction Only. **6.2 File–Handling:** Introduction, Classes for File Stream operations. Opening andclosing a file: - Opening files using constructor, opening file using open (). Detecting end-of-file, File Modes. File Pointers and their Manipulations - default actions, Functions for manipulation of File pointers. Sequential Input and Output Operations:put () and get () functions, read() and write() functions. Error Handling during file operations:	TLO 6.2 Describe different modes of file. TLO 6.3 Write C++ program to perform read/write operations from/to the given file. .			

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of hrs	Relevant COs
1.	Develop Program to define a class and create an object of a class and special type of operators	LLO1.1 Write programs to show use of classes and objects. LLO1.2 Develop C++ program using special type of operators.	**4**	**CO1**

2.	Develop Program to create & manipulate array of objects and passing object as an argument to function	LLO2.1 Implement programs to show the use of array of objects.	**2**	**CO2**
3.	Develop Program using static data member, static data function and inline function	LLO3.1 Develop program using static data member, data function and inline function.	**4**	**CO2**
4.	Develop Program for function overloading and function overriding	LLO4.1 Implement the concept of function overloading and function overriding	**2**	**CO2**
5.	Develop Program using constructor & destructor functions in class	LLO5.1 Implement the concept of constructor and destructor.	**2**	**CO3**
6.	Develop Program for overloading unary & binary operators	LLO6.1 Implement the concept of operator overloading	**2**	**CO3**
7.	Develop Program for implementation of Single and Multilevel inheritance	LLO7.1 Develop the programs using concepts of Single and Multilevel Inheritance	**2**	**CO4**
8.	Develop Program to implement Multiple & Hierarchical inheritance	LLO8.1 Develop the programs using concepts of Multiple and Hierarchical Inheritance	**2**	**CO4**
9.	Write a Program for handling Exceptions	LLO9.1 Develop the programs to handle the exceptions	**2**	**CO4**
10.	Develop Program for implementation of polymorphism using virtual function	LLO10.1 Implement the concept of polymorphism using virtual function	**2**	**CO5**
11.	Develop Program using pointer to object , array of objects and this pointer	LLO11.1 Implement pointer to object in a program. LLO 11.2 Implement 'this' pointer in a program.	**2**	**CO5**
12.	Develop Program using manipulators to format I/O	LLO12.1 Develop the programs using manipulators to format I/O	**2**	**CO6**

13.	Develop Program for file – writing to file and reading the contents of file	LLO 13.1 Implement read and write operations from/to file.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Mini project

- Develop Student Grading System. Accept student data and marks for 5 subjects for 5 students.
- Calculate the percentage and finalize grade awarded to the student. Write the records in to file.
- Develop Quiz Management System. Quiz should accept student credentials and contain 10 MCQ type questions.
- Determine the final result. Save the result in file along with student credentials.
- Develop advanced calculator for the following function: Binary to Decimal, Decimal to Binary etc.
- Develop Hotel Management Application. It should accept room reservation for 10 rooms. Find number of empty rooms. Display relevant information and write maximum 5 records into file.
- Develop Employee Management System using Inheritance. Collect following information from user:
- Employee_ID, Employee_Name, Basic_Salary, leave taken in the month Calculate Net Salary assuming applicable deductions and display. Write maximum 5 records into file.
- Any other micro project as suggested by subject faculty.

Assignment

- Solve assignment covering all COs given by teacher

Other

- Complete the course object oriented concepts using C++ on Infosys Springboard

Note:

- Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	**Equipment Name with Broad Specifications**	**Relevant LLO Number**
1	Computer system - (Any computer system with basic configuration)	All
2	"C++" Compiler (Any)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Principles of Object Oriented Programming, Beginning with C++, Tokens, Operators, Expressions and Control Structures in C++	8	3	4	3	10
2.	Functions in C++, Classes & Objects	9	3	6	6	15
3.	Constructors and Destructors, Operator Overloading	7	3	4	3	10
4.	Inheritance &Exception Handling	7	3	6	6	15
5.	Pointers and Polymorphism	6	3	4	3	10
6.	Console I/O Operations& File Handling	8	3	4	3	10
	TOTAL	45	18	28	24	70

I) ASSESMENT TOOL –

3) Formative assessment

1) Continuous assessment based on process and product related performance indicators
2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
3) A continuous assessment-based term work

4) Summative Assessment

1) End semester examination, Lab performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Author	Title	Publisher with ISBN Number
1	E Balaguruswamy	Object Oriented Programming with C++	McGraw-Hill Education ISBN-10:0070669074, ISBN-13:9780070669079
2	D Ravichandran	Programming with C++	McGraw-Hill Education ISBN-10: 0070681899, ISBN-13: 978-0070681897
3	Stroustrup B.	The C++ Programming Language	Pearson Education New Delhi ISBN-10: 0275967301, ISBN-13: 978-0275967307

Sr.No	Author	Title	Publisher with ISBN Number
4	Robert Lafore	Object Oriented Programming in C++	Pearson Education India ISBN-10: 8131722821, ISBN-13: 978-8131722824

- **WEBSITES LINKS**

Sr.No	Link / Portal	Description
1	https://www.w3schools.com/cpp/	C++ Tutorial for all topics
2	https://www.javatpoint.com/cpp-tutorial	C++ Tutorial for all topics
3	https://www.javatpoint.com/cpp-files-and-streams	C++ File Streams
4	https://www.programiz.com/cpp-programming	Inheritance in C++
5	https://www.programiz.com/cpp-programming/online-compiler/	Online Compiler for C++
6	https://www.onlinegdb.com/online_c++_compiler	Online compiler for C++

Note:
Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-POS Matrix –

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

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Microprocessors and It's Programming
Course code	R23CP2403
Course Category	DSC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3		2	1	6	3	3	30	70	100	40	25	10	25	10	25	10	175

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Microprocessor is brain of computer. Intel family is widely used all over the world. The 8085 is the 8-bit CPU and the 8086 is the 16-bit CPU. The 8086 is base of all later developed processors. It is more powerful and efficient computing machine. It overcomes all major limitations of the previous processors. It can be interfaced with 8-bit, 16-bit peripheral systems. This subject covers architecture of 8086, 80386 and Pentium processor with instruction set and assembly language programming of 8086. It also covers interfacing with memory devices. This will act as foundation for the courses like PC Maintenance.

B) EXPECTED SKILL/s –

This course aims to help the student to attain the following industry expected outcomes through various teaching learning experiences:
*Develop assembly language programs using 8086

C) COURSE OUTCOMES (COs)

1. Understand functional block diagram of 8086 and operating modes of 8086.
2. Use instructions in different addressing modes.
3. Use assembly language programming tools to develop an assembly language program.
4. Analyze the functional block diagram of 80386 and Pentium.
5. Define various interrupts and understand their need.
6. Understand use of support chips.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Architecture Of 8086 :** Introduction - Overview of 8 bit processor and limitations , Introduction to 16 bit processor- Features of 8086, Internal architecture, Pin out of 8086, functions/significance of various pins/control signals, register organization, flag register format of 8086 and its description, Physical address calculation, concept of segmentation and advantages, Maximum & minimum mode modules of 8086, comparison with 8088.	TLO 1.41 Understand the working of different processors TLO 1.2 Draw the architecture of 8086 TLO 1.3 Understand about Pin out of 8086 TLO 1.4 Calculate the physical address for the given segmentation of 8086 Microprocessor.	**6**	**10**	**CO1**
2	**8086/8088 Instruction Set and Assembler Directives :** Program development steps, Program development tools, Machine Language Instruction Formats, Addressing modes of 8086 - immediate, direct, register, register indirect, indexed, register relative, Based indexed, intersegment, intersegment, Instruction set of 8086/8088, Assembler directives and operators, Writing program for use with an assembler	TLO 2.1 Understand the assembly language program development steps TLO 2.2 Understand use of MASM software TLO 2.3 Compile, link and debug the assembly language programs TLO 2.4 Describe function of the given assembler directives with example.	**10**	**15**	**CO2**
3	**Assembly Language Programming Techniques :** Data Transfer instructions, Arithmetic Instructions, Bit manipulation instructions, String Instructions, Iteration Control Instructions, Interrupt Instructions ,Conditional Jump (Branch) Instructions, Flag Manipulation Instructions, Program Development Process/steps, Debugging assembly language programs. CALL, JMP instructions, Macros-Defining a MACRO, Passing Parameters to a MACRO, Writing & using macros.	TLO 3.1Write steps to develop a code for the given problem using assembly language. TLO 3.2 Use relevant command of debugger to correct the specified programming error. TLO 3.3 Apply relevant control loops in the program for the given problem. TLO 3.4 Use string instruction to manipulate the elements of the given block of data.	**9**	**10**	**CO3**

4	**Architecture Of 80386 and Pentium :** Features of 80386DX, Architecture of 80386, Register Organization, Data types, Addressing modes, operating modes: Real, Protected & VM 86 modes in detail, Segmentation descriptor tables and descriptors structure, Paging-Paging operation, paging unit, descriptor base register, page tables, Conversion of Linear address to Physical address, Features of Pentium, block diagram and its description, Introduction to multicore processors and salient features of i3, i5, i7,i9,i11 processors.	TLO 4.1 Understand the working of different processors TLO 4.2 Draw the architecture of 80386,Pentium TLO 4.3 Understand i3,i5,i9,i11 processors	**7**	**10**	**CO4**
5	**Interrupts and Interrupt Service Procedures :** 8086 Interrupt Types: Predefined, Software& Hardware interrupts, internal and external interrupts, Handling INTR interrupt, CPUs response to interrupt, Priority of the interrupts, Structure of Interrupt vector location table (IVT). Interrupt Programming - near, far ,PROC.	TLO 5.1 Understand Interrupts and Interrupt Service Procedures TLO 5.2 Define various interrupts	**8**	**10**	**CO5**
6	**Support Chips :** Block diagrams of octal latch(8282), octal bus transceiver (8286 / 8287), clock generator (8284) & Bus controller (8288), programmable peripheral interface (8255),organization and pins of RAM & ROM, Memory mapping of 8086, Memory banking, interfacing of RAM & ROM with 8086, concept of decoder- full, partial & PROM decoder.	TLO 6.1 Understand Support Chips And Interfacing TLO 6.2 Design interface of memory chips	**8**	**15**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

S. No.	Unit No./Cos	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	2,3	To add two 16 bit numbers	2
2	2,3	To add series of 16 bit numbers	2

3	2,3	To subtract two 16 bit numbers	2
4	2,3	To multiply two 8 bit unsigned numbers	2
5	2,3	To Multiply two 16 bit unsigned numbers	2
6	2,3	To multiply two 16 bit signed numbers	2
7	2,3	To divide 16 bit unsigned number by 8 bit unsigned number	2
8	2,3	To divide 32 bit unsigned number by 16 bit unsigned number	2
9	2,3	To divide two 16 bit unsigned numbers	2
10	2,3	To divide two 16 bit signed numbers	2
11	2,3	To add two BCD numbers	2
12	2,3	To add two ASCII numbers	2
13	2,3	To find largest among block of data	2
14	2,3	To find smallest among block of data	2
15	2,3	To arrange numbers in ascending order	2
16	2,3	To arrange numbers in descending order	2
17	2,3	Count even/odd data elements in a given string	2
18	2,3	Count positive/negative data elements in a given string	2
19	2,3	Data block transfer using string instructions	2
20	2,3	Searching target data in a given string	2
21	2,3	Compare two strings using string instruction	2
Total			**32**

F) SELF LEARNING ASSESMENT ACTIVITIES (MICRO-MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) – SKILLS DEVELOPMENT (SELF LEARNING)

Micro-project

The micro project has to be laboratory-based developed in assembly language as suggested by teacher. Each micro-project should encompass of two or more CO's which are in fact, an integration of laboratory experiments and LLO's. Some of the suggested micro projects are given below.

a. Conversion of number system-(Any one):

1. Convert hexadecimal number to equivalent BCD.

2. Convert BCD number to equivalent hexadecimal number

b. Array-(Any one):

1. Separate odd and even number from given array, store them in separate array and find the sum.
2. Separate odd and even number from given array, store them in separate array and find the smallest and largest among them.
3. Separate odd and even number from given array, store them in separate array and sort numbers in ascending and descending order.

c. Basic mathematical functions-(Any one):

1. Generate Fibonacci series.
2. Calculate a factorial of given number.

d. String manipulation-(Any one):

1. Convert given lower cases string to upper case string and vice-versa.
2. Check the given string for palindrome.
3. Search given character and its position in a string; i.e. find how many times character is present in a string and its position in a string.

Assignment

Prepare a comparative survey report of 8086 microprocessor with i3, i5, i7, i9 or AMD Ryzen processor.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	**Hardware:** Personal computer, (Processor i3 on words preferable), RAM minimum 2GB Operating system: Windows-7 onwards	All
2	**Software:** Assembler: Borland Turbo(TASM)/Microsoft Assembler(MASM) Linker: Borland Turbo(TLINK)/Microsoft(LINK) Debugger: Borland Turbo(TD)/Microsoft debugger(CS or Debug) Editor: DOS-Edit/Notepad	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Architecture Of 8086	**6**	**5**	**5**	**--**	**10**
2	8086/8088 Instruction Set and Assembler Directives	**10**	**6**	**5**	**4**	**15**
3	Assembly Language Programming Techniques	**9**	**4**	**4**	**2**	**10**
4	Architecture Of 80386 and Pentium	**7**	**5**	**5**	**--**	**10**
5	Interrupts and Interrupt Service Procedures	**8**	**5**	**5**	**--**	**10**
6	Support Chips And Interfacing	**8**	**6**	**5**	**4**	**15**
	Total	**48**				**70**

I) ASSESMENT TOOL –

- **Formative assessment**
  1. Continuous assessment based on process and product related performance indicators
  2. Each practical will be assessed considering 60% weightage to process 40% weightage to product.

- **Summative Assessment**
  1. End semester examination, Lab performance, Viva-voce.

J) LEARNING RESOURCES –

- **BOOKS**

SR. NO.	AUTHOR	TITLE	PUBLISHER
1	# A. K. Ray, K. M. Bhurchandi	Advanced Microprocessors and Peripherals- Architecture, Programming and Interfacing	Tata Mc-Graw Hill,3rd Edition, 2012. ISBN:9781259006135
2	# Douglas Hall	Microprocessor & Interfacing Programming & Hardware	Tata Mc-Graw Hill Eleventh Print 2001.
3	Barry B. Brey	The Intel Microprocessor : 8086/8088,80186/80188, 80286, 80386,80486, Pentium & Pentium Processor, Architecture, Programming & Interfacing	Prentice Hall of India, 7th Edition.
4	Peter Abel	Assembly Language Programming	Prentice Hall of India Second Edition 1994.

- **SOFTWARE/ TOOLS/ MODELS**
  Masm/ Tasm/ Boardland

- **WEBSITES LINKS**

Sr.No	Link/Portal	Description
1	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_overview.htm	Architecture of 8086
2	https://www.geeksforgeeks.org/architecture-of-8086/	Architecture of 8086
3	https://www.javatpoint.com/8086-microprocessor	Pin description and Architecture of 8086
4	https://electronicsdesk.com/assembler-directives.html	Assembler directives
5	https://www.geeksforgeeks.org/addressing-modes-8086-microprocessor/	Addressing modes of 8086
6	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_addressing_modes.htm	Addressing modes of 8086
7	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_instruction_sets.htm	Instruction set of 8086
8	https://www.javatpoint.com/instruction-set-of-8086	Instruction set of 8086

9	https://nptel.ac.in/courses/108103157	NPTEL Course on Microprocessors and Interfacing

Note:

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

Course Outcome	Program Outcome							Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	3	-	-
CO2	3	3	2	2	-	-	1	3	1	-
CO3	3	3	3	2	-	-	1	3	1	1
CO4	3	1	-	-	-	-	1	3	-	-
CO5	3	2	1	-	-	-	1	3	-	-
CO6	3	3	2	1	-	-	1	3	1	1

H: High M: Moderate and 1:1ow Re1ationship

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Data Communication
Course Code	R23CP2404
Course Category	DSC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	6	3	-	30	70	100	40	25	10	25@	10	25	10	175

Abbreviations:
CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment,SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning Assessment. Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Data communication is becoming fastest growing technology it has its impact on numerous application areas. To list a few major application areas are Business, Industry, Science, Education etc. It becomes necessary to understand the fundamentals of data communication. Subject data communication help students to understand basic concepts of signals, transmission modes, communication types, different transmission media, interface, switching techniques and the basic network reference model. Data communication is a theoretical subject and provides a basis for other computer networks subjects.

B) COURSE OUTCOMES (COs)

The students will able to
1] Select type of signal and data conversion techniques for different applications
2] Identify type of transmission media for given application.
3] Analyze various encoding techniques.
4] Predict multiplexing and switching technique for given task.
5] Identify role of each layer in OSI and TCP/IP model
6] Recognize data communication technology for various applications.

D) COURSE CONTENTS

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**1.1 Introduction to Communication:** Importance of communication, communication model: Block Diagram and components Concepts and Terminology: Analog signal, digital signal, Frequency, amplitude, frequency spectrum, bandwidth, time domain, frequency domain and data rate **1.2 Computer Communications and Networking Models** Decentralized Systems, Centralized Systems, Distributed Systems, Client/Server model, Peer to Peer model, Web-based model **1.3 Data transmission modes and Communication methods** Serial and parallel data transmission- Synchronous, Asynchronous- applications of each. Simplex, half duplex and full duplex communication, examples.	TLO 1.1 Explain the importance of data communication in various applications TLO 1.2 Draw Block diagram Data Communication Model TLO 1.3 Represent the signals in time and frequency domain TLO 1.4 Differentiate various networking models TLO 1.5 Compare Serial and Parallel data transmission TLO 1.6 Describe role of Simplex, half-duplex and full duplex communication in various applications	**8**	**10**	**CO1**
2	**Transmission Media** **2.1 Guided Media:** Twisted Pair – Construction diagram, description, characteristics, types-STP, UTP-various categories, connectors, applications. Coaxial cables – Construction diagram, description, characteristics, connectors, applications Optical fibre - Light propagation: Reflection, refraction, critical angle Construction diagram, description, propagation modes, characteristics, connectors, advantages and limitations, applications **2.2Unguided Media:** Electromagnetic spectrum,	TLO 2.1 Enlist different types of transmission media TLO 2.2 Draw construction diagram of various guided media TLO 2.3 Explain the characteristics of light TLO 2.4 Compare guided media features TLO 2.5 Describe transmission impairments	**9**	**10**	**CO2**

	Frequency allocation and propagation –Ground, line of sight, space Radio waves, Microwaves, Infrared, Applications **2.3Transmission Impairments:** Attenuation, delay distortion and noise.				
3	**Analog and Digital Communication** **3.1**Digital data, Digital signals – Unipolar, Polar – NRZ: NRZ-L, NRZ-I; RZ. Manchester, Differential Manchester, Bipolar – AMI (B8ZS, HDB3) **3.2**Digital data, Analog signals: - ASK, FSK, PSK, QAM Analog data, Digital signals: - Pulse Amplitude Modulation, Pulse Code Modulation, Sampling Theorem Delta Modulation **3.3** Analog data, Analog Signals: - Amplitude Modulation, Frequency Modulation, Phase Modulation.	TLO 3.1 Justify the need of conversion methods TLO 3.2 Represent the given data stream in digital-to-digital encoding types TLO 3.3 Explain the steps in PCM TLO 3.4 Describe different types of encoding	**10**	**15**	**CO3**
4	**Multiplexing and Switching** **4.1**Frequency Division Multiplexing, Time Division Multiplexing -Synchronous, Asynchronous, examples Wavelength Division Multiplexing, Inverse multiplexing **4.2** Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS) **4.3** Circuit Switching, Packet switching- Datagram approach, Virtual Circuit, Hybrid Switching.	TLO 4.1 Enlist types Multiplexing & switching TLO 4.2 Explain various types of multiplexing TLO 4.3 Explain spread spectrum types TLO 4.4 Compare circuit switching and packet switching	**8**	**15**	**CO4**
5	**Networking Standards and References** **5.1** Importance of standards, types of standards-Formal, Defacto, Standards making process, standard setting organizations-ISO, ITU, IETF **5.2** The OSI Model, OSI Layer and its functions **5.3** OSI Service Types- Connection oriented service, Connection less service Introduction to TCP/IP, Comparison between TCP/IP and OSI **5.4** Fiber Channel standards, applications	TLO 5.1 Explain the importance of standards TLO 5.2 Draw OSI and TCP/IP model TLO 5.3 Compare OSI and TCP/IP model TLO 5.4 Explain fiber channel standards	**7**	**10**	**CO5**

6	**Data Communication Technologies** **6.1** Broadband, Introduction to Wi-Fi and Wi- Max, Bluetooth, Universal Serial Bus (USB) **6.2** FCC, TRAI, Spectrum management, licensing **6.3** Cellular Network Introduction – Architecture Cell, Base station, Handover. **6.4** Satellite Communication Types-GEO, MEO, LEO, examples and applications.	TLO 6.1 Explain different data communication technologies TLO 6.2 Describe the role of FC and TRAI TLO 6.3 Draw cellular network architecture TLO 6.4 Describe different orbit types	**6**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Practical / Tutorial /Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1. Observe and modify PAM signal by providing input analog signal of certain frequency.	*Generation of PAM signals, waveform obs measurements.	2	1, 3
2	LLO 2. Verify and observe the effect of sampling theorem by selecting different input frequencies using frequency selector.	*Generation of analog signal and verificatio sampling theorem.	2	1, 3
3	LLO 3. Capture the PCM output and interpret the results.	*Generation of PCM signals, waveform obs measurements.	2	3
4	LLO 4. Perform demodulation of PCM signals.	Demodulation of PCM signals, waveform o measurements	2	3
5	LLO 5. Generate and observe ASK modulation.	*Generation of ASK signals, waveform obs measurements.	2	3
6	LLO 6.1 Generate and observe ASK demodulation. LLO 6.2 Generate and observe FSK modulation.	Demodulation of ASK signals, waveform o measurements *Generation of FSK signals, waveform obse measurements.	2	3
7	LLO 7. Generate and observe FSK demodulation.	*Demodulation of FSK signals, waveform c measurements.	2	3
8	LLO 8. Generate and observe PSK modulation.	*Generation of PSK signals, waveform obse measurements.	2	3
9	LLO 9. Generate and observe PSK demodulation.	Demodulation of PSK signals, waveform ob measurements.	2	3

10	LLO 10. Generate binary data and observe NRZ-L, NRZ-I, RZ, Manchester encoding types.	*Binary data generation and observation of NRZ-I, RZ, Manchester encoding types.	2	3

F) SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/SKILLSDEVELOPMENT(SELFLEARNING)

Assignment

- Solve an assignment on any relevant topic given by the Teacher.
- Case studies on relevant topics.

G) LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

Sr.No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	• Desktop / Laptop Computer • Relevant Open-Source Simulator • Virtual Labs	ALL

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Communication	CO1	6	4	6	0	10
2	II	Transmission Media	CO2	8	2	6	2	10
3	III	Analog and Digital Communication	CO3	10	4	8	3	15
4	IV	Multiplexing & Switching	CO4	9	4	8	3	15
5	V	Networking Standards & References	CO5	6	2	8	0	10
6	VI	Data Communication Technologies	CO6	6	4	4	2	10
Grand Total				**45**	**20**	**40**	**10**	**70**

I) ASSESMENT TOOL –

- **Formative assessment**
  4) Continuous assessment based on process and product related performance indicators
- **Summative Assessment**
  2) End semester examination(Lab. performance), viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title	Author	Publisher with ISBN Number
1	Data Communication and Networking (2nd edition)	#Behrouz A. Forouzan	TMG,6thEd;2022

2	Computer Networks	A.S. Tanenbaum	Pearson India ,6th Ed;2022
3	Network Security Essentials	William Stalling	PHI,6thEd;2017
4	Data Communications and Networks	AchyutGodbole	TMG,2nd Ed;2018
5	TCP/IP Principles, Protocols and Architectures	Douglas E. Comer	PHI,6thEd;2014

- **WEBSITES LINKS**

Sr. No	Link / Portal	Description
1	https://nptel.ac.in/courses/106105082	Data Communication Fundamentals
2	https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/	Data Communication-Definition, Components, Types, Channels
3	https://www.tutorialspoint.com/digital_communication/digital_communication_data_encoding_techniques.htm	Encoding Techniques
4	http://fcit.usf.edu/network/	Network Types and Topology

K) CO-PO Matrix –

Course Outcomes(COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	-	-	1	1	-	-	-	-	-
CO2	3	1	3	-	1	-	1	2	-	-
CO3	3	2	2	2	-	1	-	-	-	-
CO4	2	2	1	-	-	-	1	-	1	-
CO5	2	1	-	1	-	-	-	-	1	-
CO6	2	-	-	-	1	-	1	-	-	-

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	User Interface Programming
Course code	R23CP2405
Course Category	DSC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	-	4	2	-	-	-	-	-	50	20	50#	10	-	-	100

Abbreviations:

Legends: @ Internal, # External, *# Online Examination , @$ Internal Online Examination
Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA- Formative Assessment, SA-Summative Assessment, IKS: Indian Knowledge System, SLA- Self Learning Assessment.

A) RATIONALE

.Net is a software framework developed by Microsoft. It is used to develop different types of applications like Windows, Web application and Mobile based applications etc. The .NET Framework includes various technologies, such as ASP.NET, VB.NET, C#.NET etc. VB.Net is an object-oriented computer programming language and it as Integrated Development Environment, in which the applications can be developed, run, test, and debug. This course helps in understanding the principles and techniques involved in developing applications and graphical user interface.

B) EXPECTED SKILL/s –

Develop programs using VB. NET.

C) COURSE OUTCOMES (COs)

1. Understand the .Net framework and VB. Net features
2. Write and compile a Console based programs using data types, operators, conditional and iterative statements etc.
3. Write the programs using arrays, functions and apply the concept of exception handling.
4. Design the forms and use the different basic controls.
5. Use different Dialog Box and handle the events.
6. Write the graphics program and perform different operations on database.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs. / Week	CO Mapped
1	**Introduction: -** What is the Microsoft .NET Framework? Components of .NET Framework, Key Components of FCL, Characteristics of .NET Framework Visual Basic.NET- Introduction, VB.NET Features, advantages and disadvantages of VB. Net, applications of VB.NET, Installation of Visual Studio. Program Structure, A simple Hello World program.	1. a) Know the basics of .NET Framework and Visual Basic .NET. 1. b) Write and compile a Console based program.	3	CO1
2	**The Visual Basic .NET Language: -** Keywords, Identifiers, comments, Data types, Type Conversion Functions, Variable and Constant, Accepting Values from User, Scope of Variable, Statements - Declaration statements Executable statements Concept of Directives, Operators. Control Statements - if- Then, if Then Else, if Then Else-If and the Select case statement. Iterative Statements – Do While Loop, For Next Loop, For Each Loop, While End Loop, With End Loop. Loop Control Statements- Exit Statement, Continue Statement, GoTo Statement	2. a) Know the basics of the Visual Basic .NET language. 2.b) Use different variables, constants, operators and statements	6	CO2
3	**User defined data type** - Enum String, Arrays, Multidimensional Array, Fixed Size Array, Dynamic Array. Functions, Exception Handling	3.a) Write the programs using arrays and use the concept of Exception Handling	4	CO3
4	**Basic Controls:** - Form, Label Control, Button Control, TextBox Control, ComboBox Control, ListBox Control, RadioButton Control, CheckBox Control, PictureBox Control, ProgressBar Control, ScrollBars Control, DateTimePicker Control, TreeView Control, ListView Control, Menu Control	4.a) Know how to create forms 4. b) Know individual controls, and their use.	6	CO4

5	**MDIform** - Multiple Document Interface Form, Modal Forms. Dialog Box controls- Color Dialog Box, Font Dialog Box, OpenFile Dialog Box, SaveFileDialog Box, Print Dialog Box, Dynamic Controls, and Timer Control. Event Handling	5. a) Compile and make MDI application. 5. b) Use common dialog boxes and menus in the application.	**6**	**CO5**
6	**Introduction to Graphics:--**Introduction, creating a Graphics Object, Creating a Pen, Drawing a line, Rectangle, Ellipse, Circle, Text, Polygon & Pie. Coloring Shapes - Drawing and Filling a Rectangle, Ellipse, Polygon with Color Database Access - ADO.Net Object Model, Data Provider, Dataset. Connecting to a Database, Creating, storing and retrieving data from database.	6. a) Draw and color the different shapes. 6. b) Know how to connect, create, store and retrieve data from database.	**5**	**CO6**

- **PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –**

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Installation of Software Vb. Net and understanding its GUI	LLO 1.1Install and configure the software	**2**	**CO1**
2.	Write console-based program to calculate simple interest and use different operators.	LLO 2.1 Develop program to evaluate expressions using basic variables and operators.	**2**	**CO2**
3.	Write console-based program to implement concept of selection and iteration logic	LLO 3.1 Write a program for solving given problem using selection and iteration logic	**2**	**CO2**
4.	Write console-based program using Strings and Enum	LLO 4.1 Implement the concept of Strings and Enum	**2**	**CO3**
5.	Write console-based program Using Arrays (Fixed size & Dynamic arrays)	LLO 5.1 Develop program using arrays	**2**	**CO3**
6.	Write console-based program to implement the concept of Functions.	LLO 6.1 Develop program using functions	**2**	**CO3**
7.	Write console-based program to implement the concept of Exception Handling.	LLO 7.1 Implement the concept of exceptions.	**2**	**CO3**
8.	Create Windows Application using basic VB.NET controls like button, textbox, labels	LLO 8.1 Develop program usingcontrols like button, textbox, labels	**2**	**CO4**

9.	Create Windows Application using controls - Combo Box, List Box, Check Boxes, and Option Buttons	LLO 9.1 Develop program using controls -- Combo Box, List Box, Check Boxes, and Option Buttons	**2**	**CO4**
10.	Create Windows Application using MDI form and Dialog Box control.	LLO 10.1 Develop the program using MDI form and Dialog Box control	**2**	**CO5**
11.	Create Windows Application to Handle the events	LLO 11.1 Write a program to handle the events	**2**	**CO5**
12.	Create Windows Application Involving Design & use of Menu Strip.	LLO 12.1 Develop the program using Menu strip	**2**	**CO5**
13.	Create Windows Application to implement Graphics class.	LLO 13.1 Write a program using graphics class and draw different shapes like circle, rectangle, arc.	**2**	**CO6**
14.	Create Windows Application for connecting to database.	LLO 14.1 Write a program for connecting to database and perform different operations	**4**	**CO6**

- **SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –**
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- **LABORATORY LEARNING EQUIPMENTS REQUIRED –**

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All
2	Installation of the software VB.Net.	All

- **SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –**
  --
- **ASSESMENT TOOL –**
  - **Formative assessment**
    - Continuous assessment (Each practical) based on process and product related performance indicators.
  - **Summative Assessment**
    - End of Term Examination (Lab. performance), Viva-voce
- **LEARNING RESOURCES –**
  - **BOOKS**

Sr. No	Author	Title of Book	Publisher
1.	Programming Visual Basic .NET	Dave Grundgeiger	O'Reilly
2.	The Complete Reference -Visual Basic.NET	Jefrey R. Shapiro	Osborne/McGraw Hill
3.	Programming Microsoft Visual Basic.NET	Francesco Balena	Microsoft Press
4.	Visual Basic .NET Black Book	Steven Holzner	Paraglyph Press

- **WEBSITES LINKS**
    1. https://javatpoint.com/vb-net
    2. https://www.tutorialspoint.com/vb.net/index.htm
    3. https://www.vbtutor.net/vb2022/vb2022tutor.html
    4. http://vb.net-informations.com/

- **CO-PO-PSO Matrix –**

CO's	PO1 Basic and Discipline specific	PO2 Problem Analysis	PO3 Design / Development	PO4 Engineering Tools, Experimentation and Testing	PO5 Engineering practices for society, sustainability & environment	PO6 Project Management	PO7 Lifelong learning	PSO1 Troubleshoot hardware and network problems	PSO2 Create web and multimedia applications.	PSO3 Pursue higher education for professional development and career growth.
CO1	**2**	**1**	**–**	**2**	**–**	**–**	**1**	**1**	**2**	**–**
CO2	**2**	**2**	**1**	**2**	**–**	**–**	**–**	**1**	**2**	**–**
CO3	**1**	**3**	**2**	**2**	**–**	**–**	**–**	**2**	**2**	**–**
CO4	**2**	**2**	**3**	**3**	**–**	**–**	**–**	**1**	**3**	**–**
CO5	**2**	**2**	**2**	**3**	**–**	**1**	**–**	**1**	**3**	**–**
CO6	**2**	**3**	**3**	**3**	**1**	**1**	**1**	**3**	**2**	**1**

Legends: - High:03, Medium:02, Low:01, No Mapping –

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Animation Techniques
Course code	R23CP1402
Course Category	AEC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	4	2	8	4	-	-	-	-	-	50	20	-	-	25	10	75

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Computer animation is one of the most rapidly expanding areas of creative endeavour and technical development. Computer-generated sequences in feature films and television, digital special effects in feature films, computer-animated simulator rides, computer games and virtual environments are some of the more visible applications of 3D computer animation.
The Animation Techniques course provides an introduction to the basics of Computer Graphics, use of OpenGLand also prepares students for activities involving the design, development, and testing of modelling, rendering, and animation solutions to a broad variety of problems found in entertainment, sciences, and engineering. An exploration of drawing techniques and computer-based animation utilizing an OpenGL and Free and Open-Source software (Blender).

B) EXPECTED SKILL/s –

Develop programs using Graphics concepts and make basic animation.

C) COURSE OUTCOMES (COs)

Students will be able to -

1. Understand coordinate system and use different graphics functions and standards.

2. Understand OpenGL, apply 2D and 3D transformations (translation, rotation, scaling) and implement different projection techniques.
3. Create and manipulate 2D textures and 3D shapes, implement basic lighting and shading techniques.
4. Use of Blender, apply Lighting and Texturing effects and create animations.
5. Create simple animations using key frames, principles of animation, and apply basic textures to 3D models.
6. Use editing tools for both video and audio, apply color correction techniques.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Basics of Computer Graphics** 1.1 Coordinate system 1.2 Graphics file formats: Basics, advantages, disadvantages – BMP – GIF – JPEG – TIFF – PCX 1.3 Graphics functions & standards: Text mode, Graphic mode, Shapes, Colors, Graphics standards. 1.4 Vector scan graphic and Raster scan graphic	TLO 1.1 Describe coordinate system. TLO 1.2 Select and use various graphics file formats. TLO 1.3 Use different graphics functions and standards.	**4**	**-**	**CO1**
2	**Introduction to OpenGL** 2.1 Introduction to OpenGL, 2D Transformations, viewing, clipping 2.2 3D Transformations, viewing, clipping 2.3 Projections: Types of Projections, 3D Perspective Projection, Oblique Projection, Setting Up Projections.	TLO 2.1 Understand the Basics of OpenGL TLO 2.2Use basic transformation techniques such as translation, rotation, and scaling. TLO 2.3 Understand Types of Projections and how to set up it.	**6**	**-**	**CO2**
3	**OpenGL and GULT** 3.1 Basic OpenGL syntax, display - window management using GLUT functions. 3.2 Introduction, creating a Window, Displaying Content, Event Handling, Main Loop.	TLO 3.1 Set up a window for OpenGL rendering using the GLUT (OpenGL Utility Toolkit) library. TLO 3.2 Develop the ability to display graphical	**6**	**-**	**CO3**

	3.3 OpenGL 2D-3D functions: 2D Coordinate System, 2D Textures, 3D Coordinate System, Drawing 3D Shapes, Lighting and Shading.	content within the window using OpenGL commands. TLO 3.3 Apply textures, lightning and shading to 2D and 3D objects.			
4	**3D Modeling and Animations** 4.1 Introduction to tool - Blender 4.2 3D Modelling techniques (Extrusions, Loops) 4.3 Lightning and Texturing 4.4 Animations: Introduction, Animation Tools (Key frames)	TLO 4.1 Understand the Basics of Blender TLO 4.2Apply 3D Modeling Techniques TLO 4.3Understand and Lighting Techniques TLO 4.4 Create Basic Animations	**6**	**-**	**CO4**
5	**Animation Fundamentals and Texturing** 5.1 Key frames Animation, Interpolation techniques. 5.2 Animation principles (Squash, Stretch, Anticipation, etc). 5.3 Introduction to texturing.	TLO 5.1Understand and Apply Key frame Animation TLO 5.2Apply core animation principles such as Squash and Stretch TLO 5.3 Apply textures to 3D models using basic texturing techniques and tools	**4**	**-**	**CO5**
6	**Corrections and Editing** 6.1 Introduction to Tool 6.2 Color Correction 6.3 Editing: Audio / Video	TLO 6.1 Perform basic video and audio editing tasks TLO 6.2Use color correction tools to adjust brightness, contrast, saturation, and color balance TLO 6.3Combine video and audio elements effectively	**4**	**-**	**CO6**

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of hrs	Relevant COs
1.	Installation and setup of OpenGL (write down the steps).	LLO 1.1 Install and configure OpenGL	2	CO2
2.	Write a program in OpenGL to draw Triangle/ Circle using OpenGL	LLO 2.1 1 Implement a program in OpenGL to draw Triangle / Circle	2	CO2
3.	Write a program in OpenGL to draw Rectangle / Square using OpenGL	LLO 3.1 Implement a program in OpenGL to draw Rectangle / Square.	2	CO2
4.	Write a program in OpenGL to perform following transformations operations on Triangle / Rectangle / Square / Circle using OpenGL a) Rotation b) Translation c) Scaling	LLO 4.1 Implement a programming OpenGL for 2D Rotation, Translation and Scaling	2	CO2
5.	To understand basic functionality of Animation software - Blender	LLO 5.1 Installation of Blender and understand its basic functionality	2	CO3
6.	Draw shape of Hut / House/ Home using inbuilt computer graphics functions.	LLO 6.1 Apply inbuilt computer graphics functions to draw the shape given	2	CO3
7.	To create a model of any cartoon character	LLO 7.1 Apply 3D modeling techniques to create a model of a cartoon character.	2	CO3
8.	Create a model of screw driver.	LLO 8.1 Create a 3D model of a screwdriver using modeling tools and techniques.	2	CO3
9.	Create a model of hammer.	LLO 9.1 Create a 3D model of a hammer using modeling tools and techniques.	2	CO3
10.	Create a model of saw	LLO 10.1 Create a 3D model of a saw using modeling tools and techniques.	2	CO3

11.	Create an interior scene of home living room	LLO 11.1 Apply 3D modelling and rendering techniques in to create an interior scene of a living room.	4	CO4
12.	Create an interior scene of bed room.	LLO 12.1 Apply 3D modelling and rendering techniques in to create an interior scene of a bed room.	4	CO4
13.	Create a model of a small house using basic shapes only.	LLO 13.1 Create a simple 3D model of a small house using only basic shapes.	2	CO4
14.	Create a model of railway station using basic shapes only	LLO 14.1 Create a simple 3D model of a railway station using only basic shapes.	4	CO4
15.	Create a model of car	LLO 15.1 Apply 3D modeling techniques to create a model of a car.	2	CO4
16.	Create a model of bike	LLO 16.1 Apply 3D modeling techniques to create a model of a car.	2	CO4
17.	Create a model of a vintage table lamp with proper texturing and lightning	LLO 17.1 Apply 3D modeling, texturing, and lighting techniques to create a model of a vintage table lamp.	4	CO5
18.	Create a bouncing ball animation add texture and lightning	LLO 18.1 Applying texture and lighting to create a bouncing ball animation.	4	CO5
19.	Create a model of telescope with texture and lighting	LLO 19.1 Applying texture and lighting to create a model of telescope.	4	CO5
20.	Create a model of a wrist watch with appropriate texturing and lightning	LLO 20.1 Applying texture and lighting to create a wrist watch.	4	CO5
21.	Create a trailer of movie / short animation	LLO 21.1 Create a movie or short animation trailer incorporating animation, sound, and visual effects.	6	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Following are some suggestive self-learning topics

- Prepare a report on Open-source tools used for 2D animation.
- Prepare a report on Open-source tools used for 3D animation.
- Prepare a report on Open-source tools used for Audio and Video Editing.
- A presentation explaining any open-source tools used for 2D or 3D animation.
- A 3D model of an object or toy, with basic textures.
- A short animation (in seconds), showing the object in motion.
- Creating a short story (e.g., a day in the life of a student or a short narrative) / a promotional video (e.g., promoting a school event, hobby, or a fictional product) / a nature documentary (e.g., showcasing local parks or animals).

Note:

- Above is just a suggestive list of assignments; faculty must prepare their own bank of assignments, and activities in a similar way.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All
2	Blender Tool, Audio-video editing tool like Da Vinci Resolve	CO 4, CO5, CO6

-
-
-
-

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
-	-	-	-	-	-	-

- **ASSESMENT TOOL –**
  - **5) Formative assessment**
    A continuous assessment-based term work
  - **6) Summative Assessment**

I) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	Donald Hearn, M Pauline Baker	Computer Graphics	Prentice-Hall • ISBN-10: 0131615300 ISBN-13 : 978-0131615304
2	S. Harrington	Computer Graphics	2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.
3	D. Hearn, M. Baker	Computer Graphics with OpenGL	4th Edition, Pearson Education, 2014, ISBN 978-93-325-1871-1
4	#Stuart Mealing	The art and science of Computer Animation	Cromwell Press, Wiltshire.
5	Oliver Villar	Learning Blender: A Hands-On Guide to Creating 3D Animated Characters	Third Edition,Addison-Wesley Professional ISBN: 9780133886283
6	Oscar Baechler and Xury Greer	Blender 3D By Example	Second Edition, Packt Publishing ISBN: 9781789612561

J) WEBSITES LINKS

Sr.No.	Link / Portal
1	https://www.blender.org/support/tutorials/
2	https://www.instructables.com/Beginners-Guide-to-Blender/

Note:
Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO Matrix –

Course Outcome	Course Outcome									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	-	-	1	-	-	2	-	2	-
CO2	1	-	1	1	-	-	2	-	2	-
CO3	1	-	1	1	-	-	1	-	1	-
CO4	1	-	1	1	-	1	1	-	1	-
CO5	1	-	1	1	-	1	1	-	1	-
CO6	1	-	1	1	-	1	1	-	1	-

Legends: - High: 03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Indian Constitution
Course code	R23CP4402
Course Category	Value Education Course
Credits	1

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	25	10	25

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

A) RATIONALE:

This course aims to educate individuals about the Indian Constitution, which is crucial for democracy and empowering them to participate actively. It covers the fundamental structure, operational features, historical events, political and judicial systems, fundamental rights, directive principles, and citizens' duties. The course aims to make students responsible citizens by understanding the history, drafting, preamble, fundamental rights, relationship between rights and duties, futurist goals, and the relationship between fundamental rights and directive principles.

B) EXPECTED SKILL/s –

To perform his/her duties towards society judiciously and with conscious effort for self development and towards the development of the nation.To adopt and follow state policies in their future career and practice.

The aim of this course is to help the student to attain the following industry /employer expected outcome - Abide by the Constitution in their personal and professional life.

C) COURSE OUTCOMES (COs)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Identify and explore the basic features and modalities about Indian constitution.

CO2 - Understand the basic principles governing the system of government and its organization under the Constitution of India.

CO3 - Interpret the meaning of the constitution's authorship within the context of law, rights and government.

CO4 - Understand the administrative structure of various branches of government.

CO5 - Examine different aspects of Indian Legal System and its related bodies.

CO6 - Follow procedure to cast vote using voter-id.

D) COURSE CONTENT

Sr. No	Topics And Sub Topics	Unit Outcome UO / Learning Outcome LO	CL Hrs / week	FA TH Max	CO Mapped
1	**Architecture of the constitution and Preamble:** • Historical Background • Constituent Assembly of India • Philosophical Foundations of The Indian Constitution Preamble • Structure, Parts & Schedules of the Constitution	TLO 1.1 Explain the meaning of preamble of the constitution. TLO 1.2 Explain the doctrine of basic structure of the constitution. TLO 1.3 List the salient features of constitution. TLO 1.4 List the characteristics of constitution.	3		CO1
2	**Fundamental rights** • Meaning and significance of Fundamental Rights. • Types of Fundamental Rights and their provisions (Right to Equality, • Right to Freedom, right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies). • Judicial review and enforcement of Fundamental Rights	TLO 2.1 Enlist the fundamental rights. TLO 2.2 Identify fundamental duties in general and in particular with engineering field.	3		CO2

3	**Directive principles** • Meaning and significance of Directive Principles. • Classification and content of Directive Principles. • Relationship between Fundamental Rights and Directive Principles.	TLO 3.1 Identify situations where directive principles prevail over fundamental rights.	2		CO3
4	**Constitutional Government and Democracy** • Definition and principles of constitutional government. • Importance of constitutionalism in a democratic setup. • Role of the Constitution in governing India.	TLO 4.1 Elaborate the elements of Centre-State Relationship	2		CO4
5	**Constitutional Amendments** • Amendment procedure and significance of key amendments. • Impact of amendments on governance and democracy. • Judicial review of constitutional amendments.	TLO 5.1 Enlist the constitutional amendments. TLO 5.2 Analyze the purposes of various amendments.	2		CO5
6	**Electoral Literacy and Votes Role** • Definition and significance of electoral literacy. • Importance of informed and educated voters in a democracy. • Role of electoral literacy in strengthening democratic institutions. • Article 324: Role of Election Commissioner of India (ECI) • Article 326**:** Objectives and Components of Voter Education • Voting procedure and Voter awareness • Voter online registration Link https://ceoelection.maharashtra.gov.in/ceo/registration.aspx	TLO 6.1 Explain the importance of electoral rights. TLO 6.2 Write the step-by-step procedure for process of registration TLO 6.3 Explain the significance of Ethical electoral participation TLO 6.4 Explain the steps to motivation and facilitation for electoral participation TLO 6.5 Enlist the features of the voter's guide TLO 6.6 Explain the role of empowered voter TLO 6.7 Write the steps of voting procedure TLO 6.8 Write steps to create voter awareness TLO 6.9 Fill the online voter registration form TLO 6.10 Follow procedure to cast vote using voter-id.	3		CO6

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

- **Micro project:**

1. Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country

2. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.

3. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

- **Assignment**

Outline the procedure to submit application for Voter-id Assignments are to be provided by the course teacher in line with the targeted COs.

A1. Prepare an essay on Constitution of India.

A2. Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA A3. Self-learning topics: Parts of the constitution and a brief discussion of each part Right to education and girl enrollment in schools. GER of Girls and Boys. Right to equality. Social Democracy. Women Representation in Parliament and State Assemblies LGBTQIA+.

1. Seminar
2. Differences in the ideals of social democracy and Political democracy.
3. Democracy and Women's Political Participation in India.
4. Khap Panchayat - an unconstitutional institution infringing upon Constitutional ethos.
5. Situations where directive principles prevail over fundamental rights.
6. Group discussions on current print articles.
7. Article 356 and its working in Post-Independent India.
8. Women's Reservation in Panchayat leading to Pati Panchayats
9. Problems and Solutions. - Adoption of Article 365 in India.
10. Need of Amendments in the constitution.
11. Is India moving towards a Unitary State Model?

- **Activity:**

  Arrange Mock Parliament debates. Prepare collage/posters on current constitutional issues.

  i. National (Art 352) & State Emergencies (Art 356) declared in India.
  ii. Seven fundamental rights.
  iii. Land Reforms and its effectiveness - Case study of West-Bengal and Kerala.

- **Cases:**

Suggestive cases for usage in teaching: A.K. Gopalan Case (1950): SC contented that there was no violation of Fundamental Rights enshrined in Articles 13, 19, 21 and 22 under the provisions of the Preventive Detention Act, if the detention was as per the procedure established by law. Here, the SC took a narrow view of Article 21.

- Shankari Prasad Case (1951): This case dealt with the amenability of Fundamental Rights (the First Amendment's validity was challenged). The SC contended that the Parliament's power to amend under Article 368 also includes the power to amend the Fundamental Rights guaranteed in Part III of the Constitution.
- Minerva Mills case (1980): This case again strengthens the Basic Structure doctrine. The judgement struck down 2 changes made to the Constitution by the 42nd Amendment Act 1976, declaring them to violate the basic structure. The judgement makes it clear that the Constitution, and not the Parliament is supreme.
- Maneka Gandhi case (1978): A main issue in this case was whether the right to go abroad is a part of the Right to Personal Liberty under Article 21. The SC held that it is included in the Right to Personal Liberty. The SC also ruled that the mere existence of an enabling law was not enough to restrain personal liberty. Such a law must also be "just, fair and reasonable."

- **Other cases:**

1. Kesavananda Bharati Case (1973): In this case the Hon. SC laid down a new doctrine of the 'basic structure' (or 'basic features') of the Constitution. It ruled that the constituent power of Parliament under Article 368 does not enable it to alter the 'basic structure' of the Constitution.

This means that the Parliament cannot abridge or take away a Fundamental Right that forms a part of the 'basic structure' of the Constitution.

2. Mathura Rape Case (1979): A tribal woman Mathura (aged 14 to 16 years) was raped in Police Custody. The case raised the questions on the idea of 'Modesty of Woman' and here it was a tribal woman who succumbs to multiple pattiarchies. Custodial rape was made an offence and was culpable with the detainment of 7 years or more under Section 376 of Indian Penal Code. The weight of proofing the allegations moved from the victim to the offender, once sexual intercourse is established. The publication of the victim's identity was banned and it was also held that rape trials should be conducted under the cameras.

3. Puttswamy vs Union of India (2017): In this landmark case which was finally pronounced by a 9-judge bench of the Supreme Court on 24th August 2017, upholding the fundamental right to privacy emanating from Article 21. The court stated that Right to Privacy is an inherent and integral part of Part III of the Constitution that guarantees fundamental rights. The conflict in this area mainly arises between an individual's right to privacy and the legitimate aim of the government to implement its policies and a balance needs to be maintained while doing the same.

4. Navtej Singh Johar & Ors. v. Union of India (2018): Hon. SC Decriminalized all consensual sex among adults, including homosexual sex by scrapping down section 377 of the Indian penal code (IPC). The court ruled that LGBTQ community are equal citizens and underlined that there cannot be discrimination in law based on sexual orientation and gender.

5. Anuradha Bhasin Judgement (2020): The Supreme Court of India ruled that an indefinite suspension of internet services would be illegal under Indian law and that orders for internet shutdown must satisfy the tests of necessity and proportionality. The Court reiterated that freedom of expression online enjoyed Constitutional protection, but could be restricted in the name of national security. The Court held that though the Government was empowered to impose a complete internet shutdown, any order(s) imposing such restrictions had to be made public and was subject to judicial review.

Note: Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way. The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills. If a microproject is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record. If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

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H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table): NOT APPLICABLE

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I) ASSESMENT TOOL –

- **Formative assessment (Assessment for Learning)**
  - **Assignment, Self-learning and Terms work Seminar/Presentation**
- **Summative Assessment (Assessment of Learning)**

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J) LEARNING RESOURCES:

- **BOOKS**

Sr. No	Author	Title	Publisher with ISBN Number
1	Subhash C. Kashyap	Indian Constitution	National Book Trust, New Delhi.
2	Dr. G. B. Reddy & Mohd. Suhaib	Constitution of India and Professional Ethics	Dreamtech Press
3	B.Z. Fadia & Kuldeep Fadia	Indian Government &Politics	Lexis Nexis, New Delhi
4	Laxmikanth	Indian Polity	McGraw Hill. 5th Edition

5	B. K. Sharma	Introduction to the constitution of India	PHI, New Delhi, 6thedition, 2011, ISBN:8120344197
6	P. M. Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)
7	D. D. Basu	Introduction to the constitution of India	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X

- **WEBSITES/LINKS**

Sr. No.	Link / Portal	Description
1	http://www.legislative.gov.in/constitution-of-india	Constitution overview
2	https://en.wikipedia.org/wiki/Constitution_of_India	Parts of constitution
3	https://www.india.gov.in/my-government/constitution-india	Constitution overview
4	https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/	Fundamental rights and duties
5	https://main.sci.gov.in/constitution	Directive principles
6	https://legalaffairs.gov.in/sites/default/files/chapter%203. pdf	Parts of constitution
7	https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm	Parts of constitution
8	**https://constitutionnet.org/vl/item/basic-structure-indian-**constitution	Parts of constitution

Note: Teachers are requested to check the creative common license status / financial implications of the suggested online educational resources before use by the students

K) CO-PO Matrix –

CO's	PO1 Basic and Discipline specific knowledge	PO2 Problem Analysis	PO3 Design / Development of solutions	PO4 Engineering Tools, Experimentation and Testing	PO5 Engineering practices for society, sustainability & environment	PO6 Project Management	PO7 Lifelong learning	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	1	2
CO2	1	-	-	-	2	-	-	-	1	2
CO3	1	2	-	-	2	-	1	-	1	3
CO4	1	-	-	1	2	-	-	-	1	2
CO5	1	-	-	-	2	-	-	-	1	2
CO6	1	-	-	-	2	-	-	-	2	2

Legends: - High: 03, Medium: 02, Low: 01, No Mapping: -

SEMESTER IV

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE- 411001

Diploma Programme	Computer Engineering
Course Name	Operating System
Course code	R23CP2406
Course Category	DSC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	-	6	3	3	30	70*#	100	40	25	10	25@	10	-	-	150

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Operating systems provide an interface between the user and computer systems. It is the first piece of software to run on computer systems when it is started. It provides different services for execution of application software. Its knowledge is essential for every computer engineer to understand the management of various resources in computer system**.**

B) EXPECTED SKILL/s –

Understand and explain the structure and functions of an Operating System.
Manage processes and apply CPU scheduling techniques.
Handle memory management and page replacement methods.
Implement file management and ensure efficient use of system resources.

C) COURSE OUTCOMES (COs)

The students will able to
1. Explain the services, structure, and types of Operating Systems.
2. Describe and apply concepts of process management, inter-process communication, and threads.
3. Analyze CPU scheduling algorithms and synchronization problems.
4. Explain deadlock handling techniques and memory management concepts.
5. Apply memory allocation methods and solve problems related to page replacement algorithms.

6. Compare and analyze different file systems and directory structures.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Introduction:** **1.1 Introduction to OS**- Definition of OS, Goal of Operating system and Abstract view of the components of a computer system. Operating system services (functions), Types of Operating System- Batch Operating System, Multiprogramming Operating System, Time sharing systems, Real time systems, Distributed System, Mainframe Operating Systems, Server operating systems, Handheld Computer Operating Systems, Embedded Operating Systems, Smart Card Operating Systems, Multimedia Systems. Open-Source Operating System: Linux, BSD Unix. Booting Process of operating systems **1.2 Structure of Operating System:** Simple Structure, Layered Approach, Microkernel, Exokernel, Virtual Machine, client-server model. **1.3 Concept:** Processes, files, Shell, System calls.	TLO 1.1 Operating system concept TLO 1.2 Services provided by an operating system. TLO 1.3 Types of operating system. TLO 1.4 Understand the various structures of O.S. TLO 1.5 Concept of shell, files, processes and system calls	**10**	**15**	**CO1**
2	**Processes Management and Threads:** **2.1 Process Concept and scheduling**: Process, Process State, Process Control block, Scheduling Queues, Schedulers, Context switch, Operations on processes (only concept)- process creation and process termination.	TLO 2.1 Understand the concept of process, context switching TLO 2.2 IPC with its two types-shared memory and message passing TLO 2.3 Concept of threads.	**9**	**10**	**CO2**

	2.2 Inter process Communication: Shared Memory System, Message Passing System- Naming, Synchronization, Buffering. **2.3 Threads:** overview, benefits, multithreading models-many to one, one to one, many to many				
3	**Process Scheduling:** **3.1 Basic Concepts**- CPU I/O Burst Cycle, CPU Scheduler, Preemptive Scheduling, Dispatcher. Scheduling Criteria Scheduling Algorithms- FCFS, SJFS, Priority Scheduling, Round Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling. **3.2 Process Synchronization** — Critical Section Problem, semaphores (Usage), Deadlocks and Starvation. **3.3 Classic Problems of Synchronization**- Bounded- Buffer Problem, Readers-Writers Problem, Dining Philosopher Problem.	TLO 3.1 Understand the concept of CPU scheduler TLO 3.2 Analyze different CPU scheduling algorithms. TLO 3.3 Critical section problem in IPC, Classical Problems of Synchronization	**11**	**10**	**CO3**
4	**4.1 Deadlocks**: Deadlock Characterization (Necessary Conditions, Resource Allocation Graph) Methods for Handling Deadlocks, Deadlock Avoidance- safe state, resource allocation graph algorithm, Recovery from deadlock (Process Termination, Resource Pre-emption) **4.2 Memory Management:** Basic hardware, Address binding, logical vs. physical address space, dynamic loading, Swapping (concept).	TLO 4.1 Understand the concept of Deadlock and memory management TLO 4.2 Understand the basic concept of memory management and swapping	**9**	**10**	**CO4**

5	**5.1 Continuous memory allocation:** Continuous memory allocation Memory mapping and protection, memory allocation, fragmentation. **5.2 Non-contiguous allocation**: Paging- Basic Method, Hardware support (TLB), Protection Segmentation- Basic method, hardware. **5.3 Virtual memory management-** Background (Basic concepts) Demand paging-basic concepts (Page fault) Page replacement - Basic Page Replacement (concept), FIFO Page replacement, Optimal Page replacement, LRU Page replacement.	TLO 5.1 Continuous and non-continuous memory allocation TLO 5.2 Virtual memory management	**12**	**15**	**CO5**
6	**File Management:** **6.1 File System** - File Concept, File Attributes, File Operations, File Types. Access Methods- sequential, direct. **6.2 Directory Structure**- Storage structure, Directory overview, Single level directory, Two-level directory, tree structured directories, Acyclic Graph Directories, General graph directory, Protection – Types of access, access control **6.3 Disk Space Allocation Methods**- Continuous Allocation, Linked Allocation, Indexed Allocation.	TLO 6.1 Understand the concept of file management, TLO 6.2 Various directory structures TLO 6.3 Disk allocation methods with free space management techniques.	**9**	**10**	**CO6**

	6.4 Free Space Management-Bit vector, Linked List, Grouping, Counting				

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Study of different architectures of Operating system (Any 3 --- Windows / Linux / Android / iOS)	LLO 1.1 Understand the **architecture of different operating systems.** LLO 1.2 Identify the **components of OS architecture** like kernel, user space, system libraries, and drivers.	**2**	**CO1**
2.	Write a C program for System Call Implementation	LLO 2.1 Understand the concept of **system calls in an operating system.** LLO 2.2Learn how a **user program interacts with the OS kernel.**	**2**	**CO1**
3.	Write a C program for Inter Process Communication using Pipes	LLO 3.1 Understand the concept of **Inter Process Communication (IPC).** LLO 3.2 Learn how **pipes allow communication between processes.**	**2**	**CO2**
4.	Write a program to calculate total waiting and total turnaround time of n processes using FCFS scheduling algorithm	LLO 4.1 Understand the concept of **CPU scheduling in operating systems.** LLO 4.2 Learn the working of **First Come First Serve (FCFS) scheduling algorithm.**	**2**	**CO3**
5.	Write a program to calculate total waiting and total turnaround time of n processes using Pre-emptive & Non-pre-emptive scheduling algorithm	LLO 5.1 Understand the difference between **pre-emptive and non-pre-emptive scheduling.**	**2**	**CO3**

		LLO 5.2 Calculate **waiting time and turnaround time**for processes.		
6.	Write a program to calculate total waiting and total turnaround time of n processes using scheduling algorithm	LLO 6.1 Learn how **CPU scheduling algorithms manage processes.** LLO 6.2 Calculate **total waiting time and turnaround time.**	**2**	**CO3**
7.	Write a program to calculate total waiting and total turnaround time of n processes using Priority scheduling algorithm	LLO 7.1 Understand the concept of **priority-based CPU scheduling.** LLO 7.2 Calculate **waiting time and turnaround time**for processes.	**2**	**CO3**
8.	write a program to calculate total waiting and total turnaround time of n processes using Round-Robin scheduling algorithm	LLO 8.1Learn how the **Round Robin algorithm allocates CPU time slices.** LLO 8.2Calculate **waiting time and turnaround time** for processes.	**2**	**CO3**
9.	Program for implementation (Producer – Consumer problem)	LLO 9.1 Understand the **Producer–Consumer synchronization problem.** LLO 9.2 Implement **buffer sharing between producer and consumer processes.**	**2**	**CO3**
10.	Write a program to stimulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit	LLO 10.1 Learn different **memory allocation strategies.** LLO 10.2 Implement **Worst-Fit, Best-Fit, and First-Fit algorithms.**	**2**	**CO5**
11.	Write a program to implement FIFO /LRU /OPR page replacement algorithm	LLO 11.1 Understand the concept of **virtual memory and page replacement.** LLO 11.2 Learn how **FIFO, LRU, and Optimal algorithms manage memory pages.**	**2**	**CO5**

12.	Write a C program of File Allocation methods and free space management in storage - Contiguous allocation.	LLO 12.1Learn how **contiguous file allocation stores files in memory blocks.** LLO 12.2 Implement a **C program to simulate file storage allocation.**	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Self-Learning

- Report on any Operating system architecture
- Write a program to calculate total waiting and total turnaround time of n processes using FCFS / SJF / Priority / Round robin scheduling algorithm (any one) any programming language.
- Solve the problems based on FCFS / SJF / Priority / Round robin scheduling algorithm
- Write a program to implement FIFO /LRU / OPR page replacement algorithm (any one) using any programming language.
- Solve the problems based on FIFO /LRU / OPR page replacement algorithm.
- Solve the problems based on contiguous memory allocation techniques
  a) Worst-fit b) Best-fit c) First-fit
- Write a Program for implementation of Producer – Consumer problem

Assignment

- Solve assignment covering all COs given by teacher

Note:

- Above is just a suggestive list of assignments; faculty must prepare their own bank of assignments, and activities in a similar way.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction and structure of operating System	9	6	9	-	15
2.	Process management and threads	9	4	6	-	10
3.	Process scheduling	12	2	3	5	10
4.	Deadlock and Memory management	9	4	6	-	10
5.	Contiguous, Non-contiguous and Virtual Memory Management	12	4	6	5	15
6.	File management and Directory Structures	9	4	6	-	10
		60	**24**	**36**	**10**	**70**

I) ASSESMENT TOOL –

1) Formative assessment

2) Continuous assessment based on process and product related performance indicators.

Summative Assessment

- End Semester Examination, Viva-voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	Silberschatz, Galvin and Gagne	# Operating System Concepts	Wiley India Pvt. Ltd., 8th Edition
2	Tannenbaum A. S.	Modern Operating Systems	Prentice Hall of India, 2nd Edition.
3	Milan Milenkovic	Operating Systems: concept and Design	McGraw Hill, 2nd Ed, 2001
4	Achut S. Godbole	Operating Systems	Tata McGraw Hill, 2nd Edition ,2005

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1	https://www.os-book.com/OS8/os8j/practice-exer-dir/index.html
2	https://archive.nptel.ac.in/courses/106/105/106105214/
3	https://www.javatpoint.com/operating-system
4	https://naim30.github.io/OS-virtual-lab/index.html

K) CO-PO-PSO Matrix –

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

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Database Management Systems
Course code	R23CP2407
Course Category	DSC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

Abbreviations:

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Database management has evolved from a specialized computer application to a central component of a modern computing environment. Knowledge about database systems has become an essential part of an education in computer science. Organizations are employing mechanisms to effectively manage and utilize data stored in the databases. This course includes aspects of database design, database languages and database system implementation.

B) EXPECTED SKILL/s –

To design database and use any RDBMS package as a backend for developing database applications.

C) COURSE OUTCOMES (COs) –

Students will be able to

1. Understand the concept of database systems and draw ER diagram.
2. Create database, modify, and append data in database.
3. Apply integrity constraints and normalize database to normal forms.
4. Write PL/SQL programs and handle the errors in PL/SQL.
5. Write cursor programs and apply the concept of transaction and concurrency control.
6. Write function programs and know the concept of distributed database**.**

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1.	**Introduction To Database System:** **1.1 Database concepts:** Data, Database, Database management system, Database System Applications, Purpose of Database Systems (File system Vs DBMS). **1.2 View of Data** – Data Models, Relational Data Model, Data Abstraction, Instances and schemas,. **1.3 Database Languages** -Data Definition Language, Data Manipulation Language, Database access from application programs. **1.4 Data Engine:** Storage Manager, The Query Processor. **1.5 Database and Application Architecture**. **1.6 Database Users and Administrator** - Database Users and User Interfaces, Database Administrator.	**TLO 1.1** Understand the concept of **data, database, and DBMS** **TLO 1.2** Describe the **database architecture** **TLO 1.3** Describe **database languages** (DDL, DML, DCL, TCL)	**7**	**10**	**CO1**
2.	**Relational Data Model and Entity-Relationship Model:** **2.1 Structure of Relational Database**: Tables (Relations), Rows (Tuples), Attribute, Domain, Keys, The E. F. Codd's rules. **2.2 Entity-Relationship Model:** Introduction (Entity-relationship diagram - Basic Structure) Entity sets, relationship sets, Complex attributes. Mapping Cardinalities, Primary Key-Entity sets, Relationship sets, Weak entity sets. **2.3 Relational Database Design:** Pitfalls in relational database design, Functional Dependencies, Normalization, Types of Normalization 1NF, 2NF, 3NF.	**TLO 2.1** Creating and Manipulating Tables **2.1.a** Creating tables using DDL commands (CREATE, ALTER, DROP) **2.1.b** Manipulating data using DML commands (INSERT, UPDATE, DELETE, SELECT) **TLO 2.2** Writing SQL Queries **2.2.a** Basic queries (SELECT, WHERE, ORDER BY) **2.2.b** Joins (INNER JOIN, OUTER JOIN, SELF JOIN) **2.2.c** Aggregate functions (SUM, AVG, COUNT, GROUP BY, HAVING)	**8**	**10**	**CO2**

		2.2.d Subqueries and nested queries **TLO 2.3** E-R Model **2.3.a** Identify the various components of the E-R model (entities, attributes, relationships, keys) **2.3.b** Draw the E-R diagram for a given scenario			
3.	**Structured Query Language (SQL):** **3.1 Overview of SQL**, Data Types in Oracle. **3.2 Sublanguages of SQL**-Data Definition Language (create, alter, truncate, drop), Data Manipulation Language (insert, select, update, delete). Oracle transactions(Transaction Control Language (TCL) - commit, rollback and save point) Sorting of data, aggregate functions, grouping data from tables (Group by and having clause), and SET operators in oracle (Union, Intersect, Minus), Security management in SQL- Concept of Authorization. , (Data Control Language (DCL)) granting and revoking permission. **3.3 Integrity constraints:** Types of integrity constraints: -1) Domain integrity constraint 2) Entity integrity constraint 3) Referential integrity constraint, **3.4 Joins:** Types of Joins, Nested queries. **3.5 Encryption and its Applications** : Encryption Techniques.	**TLO 3.1** Writing the queries for **creating the user** and **granting permissions** **TLO 3.2** Describe the **integrity constraints** **TLO 3.3** Normalize the database using different **normal forms**	**9**	**15**	**CO3**
4.	**Procedural Language/Structured Query Language (PL/SQL):** **4.1 Introduction**: Introduction to PL/SQL, advantages of PL/SQL, the generic PL/SQL	**TLO 4.1** Write simple **PL/SQL programs using control structures**	**8**	**15**	**CO4**

	block, PL/SQL execution environment, character set, literals, PL/SQL data types, variables, constants, logical comparisons, displaying user messages, comments, control structures (conditional, iterative, sequential). 4.2 Error handling in PL/SQL, oracle's named exception handlers: user-named exception handlers, user defined exception handling (For Business Rule Validations).	**TLO 4.2** Handling **in-built and user-defined exceptions**			
5.	**Cursor, Transaction and Concurrency Control Manager :** **5.1 Cursors:** Cursor: what is cursor? Types of cursors- General Cursor Attributes Implicit Cursor, Implicit Cursor Attributes, Explicit Cursors – Explicit Cursor Management, Cursor Declaration, The functionality of Open, Fetch And Closed Command, Fetching Record from the cursor, closing a cursor, Explicit cursor attributes ,cursor for loops, parameterized cursor. Programs based on cursors. **5.2 Transaction and Concurrency Control:** Transaction -Transaction Concept (ACID Properties), Transaction Atomicity and Durability (Transaction State Diagram), Transaction Isolation, Concurrency Control - Lock based protocols (Introduction to Locks), Granting of locks **5.3 Deadlock Handling – Deadlock Prevention.** Deadlock Detection and Recovery— Deadlock Detection, Recovery from Deadlock. 5.4 Database Backup: Types of failures, Causes of failures, Database backup introduction ,types of database backups: physical& Logical	**TLO 5.1** Write **PL/SQL programs using cursors** **TLO 5.2** Understand the concept of **Transaction, ACID properties, and Locks** **TLO 5.3** Understand the **Deadlock concept and Deadlock Handling**	**8**	**10**	**CO5**
6.	**6.1 PL/SQL Database Objects (Functions):** What are Functions? Where do stored functions reside? How does the oracle engine	**TLO 6.1** Write **PL/SQL programs using functions**	**5**	**10**	**CO6**

	execute functions? Advantages and disadvantages of using functions, and functions syntax, deleting function. Programs based on functions. **6.2 Distributed Databases:** Distributed Systems- Concept and its advantages and disadvantages, Homogenous and Heterogeneous Databases. **6.3 Overview of Advanced database concepts**: - Data Warehouse, Datalakes, Data mining, Bigdata, MongoDB, DynamoDB,NoSQL	**TLO 6.2** Understand the concept of **Distributed Databases, Data Storage, and Distributed Transactions** **TLO 6.3** Overview of Advanced Database Concepts			

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	1.a. Install the provided database software 1.b.Create Database schema for given application	**LLO 1.1** Installation of database software **LLO 1.2** Create Database schema for given application	**4**	**CO1**
2.	To use the Data Definition Language (DDL) for creating, altering and droping the table object in a database	**LLO 2.1** Execute DDL Commands to manage database using SQL	**2**	**CO2**
3.	To use the Data Manipulation language (DML) for inserting, selecting, updating and deleting the data in the table in a database	**LLO 3.1** Execute DML Commands to manipulate data using SQL	**2**	**CO2**
4.	To create the table from an existing table and to populate a table with the contents of an existing table.	**LLO 4.1** Execute DDL &DML Commands to create and populate the table from an existing table.	**2**	**CO2**
5.	To use the Transaction control language (TCL) in a Database.	**LLO 5.1** Execute TCL Commands to control transactions on data using SQL	**2**	**CO2**
6.	To use the Data Control Language (DCL) for granting and revoking permission.	**LLO 6.1** Execute DCL Commands to control the access to data using SQL.	**2**	**CO2**
7.	To use arithmetic, comparison and logical operators in a database.	**LLO 7.1** Implement Queries using built-in arithmetic, comparison and logical operators.	**2**	**CO3**
8.	To use comparison operators in ORACLE for range searching and pattern matching of table data.	**LLO 8.1** Implement Queries using range and pattern matching operators.	**2**	**CO3**

9.	To use Group Functions and Set Operators in Databases	**LLO 9.1** Implement queries using Aggregate functions and Write Queries to implement SET operations using SQL.	**2**	**CO3**
10.	To use Order By, Group by and Having clause in a Database	**LLO 10.1** Execute Queries for ordering and grouping data.	**2**	**CO3**
11.	To use SQL character functions and Numeric functions in a Database.	**LLO 11.1** Execute queries using character functions. **LLO 11.2** Execute queries using Numeric functions.	**2**	**CO3**
12.	To use the Date functions in a Database.	**LLO 12.1** Execute queries using Date functions	**2**	**CO3**
13.	To implement Domain and Entity Integrity Constraints on a Database.	**LLO 13.1** Write queries for applying Domain and Entity Integrity Constraints for suitable relation	**2**	**CO3**
14.	To implement Referential Integrity Constraints on a database.	**LLO 14.1** To implement Referential Integrity Constraints on a database.	**2**	**CO3**
15.	Usage of subqueries in a Database.	**LLO 15.1** Execute queries using Subqueries.	**2**	**CO3**
16.	To relate data through join concept in a Database	**LLO 16.1** Execute the queries based on joins.	**2**	**CO3**
17.	Write a PL/SQL program using Conditional Statements	**LLO 17.1** Implement PL/SQL program using Conditional Statements.	**2**	**CO4**
18.	Write a PL/SQL program using iteration Statements in PL/SQL.	**LLO 18.1** Implement PL/SQL program using Iterative Statements.	**2**	**CO4**
19.	Write a PL/SQL program using Exceptions in PL/SQL.	**LLO 19.1** Implement PL/SQL program based on Exception Handling (Pre-defined exceptions& User defined exceptions).	**2**	**CO4**
20.	Write a PL/SQL program to implement Implicit cursor.	**LLO 20.1** Create implicit cursors.	**2**	**CO5**
21.	Write a PL/SQL program to implement Explicit cursor.	**LLO 21.1** Create explicit cursors.	**2**	**CO5**
22.	Write a PL/SQL program to implement Cursor for loop and parameterized cursor	**LLO 22.1** Create cursors using Cursor for loop and also passing parameters to cursor.	**2**	**CO5**
23.	Write a PL/SQL to create Functions in PL/SQL	**LLO 23.1** Create function for given database.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) – Self-Learning

- Report on different database management systems
- Draw ER diagram for given problem
  1) Create Database for given application
  2) Create tables for the given application

3) Assign Primary key for created table
4) Modify the table as per the application needs.
5) Normalize the relation up to 3NF

- Implement PL/SQL code for relevant topics suggested by the teacher.
- Complete any one course related to Database Management System on Infosys Springboard platform.
- Any topic suggested by teacher.

Assignment

- Solve assignment covering all COs given by teacher

Micro project

- Develop a database for restaurant management system. The restaurant maintain catalogue for the list of food items and generate bill for the ordered food.
- Prepare Invoice management system for electricity bill generation. Accept meter reading as inputs and generate respective bill amount for the same.
- Develop a database for Library management system. The library maintain catalogue for the list of books and generate bill for the books.
- Any topic suggested by teacher**.**

Note:

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer system - (Any computer system with basic configuration)	All
2.	Any RDBMS software (MySQL/Oracle/SQL server/ or any other)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction To Database System	**7**	**3**	**4**	**3**	**10**
2.	Relational Data Model and Entity-Relationship Model	**8**	**3**	**6**	**6**	**10**
3.	Structured Query Language (SQL)	**9**	**3**	**4**	**3**	**15**
4.	Procedural Language/Structured Query Language (PL/SQL)	**8**	**3**	**6**	**6**	**15**
5.	Cursor, Transaction and Concurrency Control Manager	**8**	**3**	**4**	**3**	**10**
6.	PL/SQL Database Objects (Functions) and Distributed Databases	**5**	**3**	**4**	**3**	**10**
	TOTAL	**45**	**18**	**28**	**24**	**70**

I) ASSESMENT TOOL –

3) Formative assessment

1) Continuous assessment based on process and product related performance indicators
2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
3) A continuous assessment-based term work

4) Summative Assessment

1) Lab performance, Viva voce.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Database System Concepts	Tata Mc-Graw Hill Publications, 6th Edition, 2005
2.	Ivan Bayross	SQL, PL/SQL – The Programming language of Oracle. 4th Revised Edition	BPB Publications, 4th Edition, 2009 (Reprinted 2011)
3.	Ivan Bayross	ORACLE DEVELOPER 2000 (First Edition)	BPB Publications, 2008
4.	Vikram Vaswani	MySQL: The Complete Reference	Tata Mc-Graw Hill Publications, 1st Edition, 2004

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	https://www.db-book.com/
2.	https://nptel.ac.in/courses/106105175
3.	https://www.w3schools.com/sql/
4.	https://www.tutorialspoint.com/sql/index.html
5.	https://www.mysqltutorial.org/
6.	www.tutorialspoint.com/mysql

Note:

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	1	-
CO2	3	2	1	2	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	1	-
CO4	2	3	2	1	-	-	-	-	2	-
CO5	2	3	2	1	-	-	-	-	2	-
CO6	2	2	1	-	-	-	1	-	1	2

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Computer Networks
Course code	R23CP2408
Course Category	DSC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175

Abbreviations:

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This course provides basic knowledge of computer networks, including network types, protocols, IP addressing, routing, and security. It helps students understand data communication, configure network services, and apply security concepts, preparing them for careers in networking and **cybersecurity**.

B) EXPECTED SKILL–

The expected skill set of this course is to enable students to attain the following industry identified outcome through various teaching-learning experiences: apply networking concepts and modern technologies to design, manage, and secure computer networks in real-world scenarios.

C) COURSE OUTCOMES (COs)

The students will be able to

1. Identify type of network, topology, components and its role in different applications.
2. Select specific Ethernet type from given criteria.
3. Describe principles, design issues of layers and relate protocols with OSI and TCP/IP model layers.
4. Relate protocols of transport and application layer
5. Design networks with IPv4 addressing.
6. Identify role of cryptography in various Network applications.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Introduction:** 1.1 Computer network, need & applications. Classification of network – i) Based on component role: Peer to Peer, Client-Server. ii) Based on Geographical Area: LAN, MAN, WAN 1.2 Internet connectivity requirements Bandwidth, Connection type, Internet Service Provider Support. 1.3 Network components: Repeater, Hub, Switch- types of switches, Router, Bridge, gateway, Modem, Wireless devices. 1.4 Network Topology – Mesh, Bus, Ring, Star, Tree, Hybrid Topology, Topology Comparison.	TLO1.1: Define Computer network. TLO1.2: Describe the applications of computer networks across multiple domains. TLO1.3: Classify different types of networks. TLO1.4: Identify internet connectivity requirements for practical applications. TLO1.5: Describe role of various network components. TLO1.6: Differentiate between the various types of topologies.	7	10	CO1
2	**Local Area Network:** **A. Wired LAN** 2.1 Ethernet, IEEE Project 802- LLC, MAC, Access method (CSMA/CD) 2.2 Ethernet Standards (802.3) -Thick Ethernet (10Base5), Thin Ethernet (10Base2), 10Base-T, 10Base-F 2.3 Ethernet Technologies: Switched Ethernet, Fast Ethernet, Gigabit Ethernet **B. Wireless LANs (WLAN)**	TLO2.1: Explain Project 802. TLO2.2: Describe various ethernet standards. TLO2.3: Identify ethernet technologies. TLO2.4: Draw Architecture of WLAN. TLO2.5: Enlist the different WLAN standards.	8	10	CO2

	2.4 Architecture, Comparison of Wired and Wireless LAN, Frequency bands. 2.5 Standards: IEEE 802.11, Wi-Fi, Bluetooth.				
3	**Data link and Network Layer Protocols:** **A. Data Link Layer** 3.1Design issues of data link layer, services provided to the network layer, Framing, Error control, flow control, congestion control schemes-Leaky bucket algorithm. 3.2 Data link layer protocols-Stop and Wait, Sliding Window - Go Back N, Selective Repeat, PPP- PPP Layers, Link Control Protocol, Authentication-PAP, CHAP. **B. Network Layer Protocols** 3.3 IP: IP Datagram, Version, Service Type, Identification, Flags, TTL, Protocol, Header, Checksum, Options. 3.4 ARP: ARP Introduction, Structural Diagram, ARP Process RARP: RARP Introduction, RARP Process	TLO3.1: Explain design issues and services of data link layer TLO3.2: Understand the protocols used at data link & network layer. TLO3.3: Explain IP Datagram Structure TLO3.4: Explain ARP and RARP	**9**	**15**	**CO3**
4	**IP Addressing and Routing** 4.1 IP address structure, classes of IP address, IPv6 introduction 4.2 DHCP, address pool, address leasing, reservation, advantages and applications. 4.3 Subnet - subnet addressing and address masking. 4.4 Routing - importance, routing table, hop, routing algorithms- link state, distance vector protocols - RIP, OSPF.	TLO 4.1Classify IP Addresses on the basis of its class from the given set of addresses. TLO4.2: Perform Subnetting and Address Masking. **TLO4.3: Explain Routing Concepts and Algorithms**	**7**	**10**	**CO4**

5	**Transport and Application Layer Protocols** 5.1 TCP: Role of transport layer, functions of transport layer, Connection establishment (Handshake), Segment header format, ports, sockets, applications. 5.2UDP: UDP header format, limitations, comparison of TCP and UDP, applications. 5.3 SMTP: Architecture, User Agent, Mail Transfer Agent, Mail Access Agent - Post Office Protocol, version3 (POP3), Internet Mail Access Protocol version4 (IMAP4) Multipurpose Internet Mail Extensions(MIME) 5.4 FTP: Basic Model of FTP, process. 5.5 DNS- Purpose, Architecture.	TLO5.1: Describe with sketches the procedure to configure the given TCP/IP service. **TLO5.2: Explain** the concept and working of UDP. **TLO5.3: Explain** architecture of SMTP. **TLO5.4: Describe** FTP process (control connection and data connection). **TLO5.5: Explain** purpose of DNS.	**8**	**15**	**CO5**
6	**Network Security** 6.1 Security goals- Confidentiality, Integrity, Availability. Security Attacks, network security systems - Firewall, VPN. 6.2 Cryptography- Types of Ciphers i) Symmetric key - Substitution & Transposition Cipher ii) Asymmetric key – Public key ciphers. Digital Signature 6.3 Cyber security, Threats to security- Viruses, Worms, phishing, Intruders, Insiders, Criminal organizations, Terrorists. 6.4 Web security - Cross site scripting, SQL injection	TLO6.1Understand network security and explain security goals and importance of web security. **TLO6.2: Describe** types of ciphers. **TLO6.3: Differentiate** between symmetric and asymmetric key. **TLO6.4: Explain** concept and working of digital signature and **describe** threats.	**6**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESSMENT WORK

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial /Laboratory Learning Outcome (LLO)	Number of hrs.	Relevant COs
1	Design a network topology and implement it on a network simulator.	**LLO 1:** Design and implement different network topologies using a network simulator to analyze network performance and connectivity.	2	CO 1
2	Case study on Internet Access in rural areas.	**LLO 2:** Analyze challenges and propose suitable networking solutions for providing internet access in rural areas.	2	CO 2
3	Implement stop & wait protocol using any programming language.	**LLO 3:** Implement the Stop-and-Wait protocol using a programming language to demonstrate flow control and error handling mechanisms.	2	CO 3
4	Implement sliding window protocol using any programming language.	**LLO 4:** Develop and test Sliding Window protocol to improve transmission efficiency and analyze its performance.	2	CO 3
5	Capture the packets and study protocol format using packet analyzer tool (Wireshark).	**LLO 5:** Capture and analyze network packets using Wireshark to interpret protocol formats and communication behavior.	2	CO3
6	Configure IP address and implement various networking commands using command line.	**LLO 6:** Configure IP addressing and execute networking commands using command line tools to troubleshoot network connectivity issues.	2	CO4
7	Design & implement wireless network using network simulator.	**LLO 7:** Design and simulate a wireless network using network simulation tools to evaluate signal coverage and performance.	2	CO2
8	Implement various encryption techniques.	**LLO 8:** Implement basic encryption techniques to ensure data confidentiality and understand cryptographic principles.	2	CO6
9	Perform a case study on security of a banking system.	**LLO 9:** Evaluate security mechanisms in banking systems and identify potential vulnerabilities and protective measures.	2	CO6
10	Implement and analyze web security tools, for cross-site scripting & SQL injection.	**LLO 10:** Implement and analyze web security tools to identify and prevent vulnerabilities such as cross-site scripting and SQL injection.	2	CO6

Note: Out of above suggestive LLOs-

- '*'Marked Practical's (LLOs) are mandatory.
- Minimum 80% of above list of lab experiments are to be performed.
- Judicious mix of LLOs is to be performed to achieve desired outcomes.

F) SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Solve assignment covering all COs given by teacher.

G) LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system (Any computer system with basic configuration, connected to LAN)	All
2	Cisco Packet Tracer , MiniNet or any other similar software	All
3	Wireshark or any other similar software to capture and investigate packets	All

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction To Computer Network	1	7	4	5	2	10
2	II	Local Area Network	2	8	3	6	2	10
3	III	Data link and Network Layer Protocols	3	9	3	8	3	15
4	IV	IP Addressing and Routing	4	7	3	6	2	10
5	V	Transport and Application Layer Protocols	5	8	3	6	3	15
6	VI	Network Security	6	6	4	4	3	10
Grand Total				**45**	**20**	**35**	**15**	**70**

I) ASSESSMENT TOOL

5) Formative assessment

1) Continuous assessment based on process and product related performance indicators.

2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product.
3) A continuous assessment-based term work.

6) Summative Assessment

2) Lab performance, Viva voice.

J) SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Title of Book	Author	Publication (with year)
1	Computer Networking: A Top-Down Approach	James F. Kurose & Keith W. Ross	Pearson Education — various editions; latest (9th edition)
2	Data Communication and Networks	Dr. Brahampal Singh	BPB Publications, **2024**
3	Data Communications and Networking	Behrouz A. Forouzan	McGraw Hill Education, *5th Edition (also available in later 6th Edition under the title Data Communications and Networking with TCP/IP Protocol Suite)*
4	Computer Networks, Sixth Edition	Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall	Pearson ISBN-13: 9780136764052

- **WEBSITE LINKS**

Sr. No	Link/Portal	Description
1	https://www.coursera.org/courses?query=computer%20networks	Offers courses from top universities like Stanford and Princeton on topics like Internet architecture, IP addressing, and advanced networking technologies.
2	https://www.javatpoint.com/computer-network-tutorial	Focuses on networking tutorials and courses, including detailed lessons on routing protocols, TCP/IP, and advanced networking concepts.
3	https://www.geeksforgeeks.org/computer-networktutorials/	Computer Network concepts tutorial.
4	https://www.javatpoint.com/software-definednetworking-sdn-benefits-and-challenges-of-network-virtualization	Software defined network

K) CO-PO-PSO Matrix

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	1	-	-	-	-	-	-	-
CO2	2	2	1	2	-	-	1	1	-	-
CO3	3	2	1	-	2	-	1	1	-	-
CO4	3	-	1	3	-	-	-	-	-	-
CO5	3	-	-	1	-	-	-	-	-	-
CO6	2	-	-	-	2	-	1	2	-	1

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer
Course Name	PYTHON PROGRAMMING
Course code	R23CP1403
Course Category	AEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	1	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Introduction to Python Programming course is intended for students with little or no programming experience. It aims to provide students with an understanding of the role computation can play in solving problems and, regardless of their major, feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals.Python is an open source, general-purpose and most versatile programming language. Python code is simple, readable, short, intuitive, and powerful, and thus it is effective for introducing computing and problem solving for beginners. This course covers basic fundamentals of Python programming, which also provides a foundation for further exploration of its more advanced applications in a variety of domains, including application development, data science, artificial intelligence, machine learning, and more.

B) EXPECTED SKILL/s –

Develop applications using python to solve given problem.

C) COURSE OUTCOMES (COs)

The student will be able to

CO1: Install the Python and understand various concepts related to Python.

CO2: Select proper operators for desired task.

CO3: Develop python programs using control flow statements.
CO4: Develop packages to solve given problem using Python.
CO5: Perform operations on various data structures in Python.
CO6: Perform file operations using Python

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**Introduction to Python and It's Basics:** Features of python, Python get started, Python Syntax, Python comments, Indentation, Execution of python program, Python IDEs, comparison between c and python, Installation and Working with Python, Understanding Python variables and rules, Python data types, Python numbers, Python casting, Python string, Escape Characters, Use of type(),input(),print().	TLO 1.1 Explain features of python. TLO 1.2 Write python program to perform basic input output operations.		**15**	
2	**Python Data Types and It's Use:** Main Data types ,Operators Declaring and using Numeric data types: int, float, complex, string data type and string operation, mutable vs immutable data types, Define string, tuple, list and slicing, Use of Tuple data type and Manipulation.	TLO 2.1 Write python program to solve given expression. TLO 2.2 Write python program to manipulate tuples.		**10**	
3	**Python Program Flow Control Statements:** Conditional blocks using if, else and elif, Simple for loops in python, For loop using range(), string, list and dictionaries, Use of while loops	TLO 3.1 Understand decision making statements and looping statements in python program.		**10**	

	in python ,Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block to solve mathematical problems.	TLO 3.2 Implement given decision making statements and looping statements in python program.			
4	**Python Functions, Modules and Package** : Organizing python codes using function, arbitrary arguments, default parameters, List as argument,Recursion,Module, Biult in Module, Organizing python projects into modules, Importing own module as well as external modules,Packages,Powerful Lambda function in python, Programming using functions.	TLO 4.1 Write relevant user defined functions for the given problem. TLO 4.2 Write relevant user defined module for the given problem. TLO 4.3 Write packages for the given problem.		**10**	
5	**Python Data structures: String, List, Dictionary and Set Manipulations** : Building blocks of python programs, String in built methods, List manipulation using in built methods, Dictionary manipulation programming using string, list and dictionary in built functions, Set and Set Manipulation, Libraries in Python-Pandas, Numpy.	TLO 5.1 Write python program to manipulate lists. TLO 5.2 Write python program to manipulate sets. TLO 5.3 Write python program to manipulate dictionaries.		**10**	
6	**Python File Handling and Operation**s: File handling,open(),close() and File modes, Reading config files in python, File methods and syntax , read functions- read(), readline() and readlines(),write functions- write() and writelines(),programming using file operations.	TLO 6.1 Understand files modes. TLO 6.1 Understand various file operations.		**15**	

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/ Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Install the given Python IDE.	Install given Python IDE.	2	CO1
2	LLO1.2 Write python program for performing basic input and output operation in given problem.	*1.Write python program to display welcome message on screen. 2. Implement the python program to read data from user and display data on screen.	2	CO1
3	LLO2.1Write python program to solve given expression.	*Implement a python programs using following operators: 1. Arithmetic 2. Relational &logical 3. Assignment 4. Bitwise 5. Membership 6. Identity	2	CO2
4	LLO 3.1 Write python program for solving given problem using various if statements.	*Implement a python program to Demonstrate the use of following conditional statements: 1. if statement 2. if..else statement 3. if..elif..else statement 4. nested if statement	2	CO3
5	LLO 3.2 Write python program for solving given problems using a while loop. LLO 3.3 Write python program for solving given problem using for loop.	*Implement a python program to Demonstrate the use of following looping statements: 1. while loop 2. for loop 3. nested loop	2	CO3
6	LLO3.4Use loop control statements in python for solving given problem.	Implement python program to demonstrate The use of loop control statements.[continue, pass, break, else]	2	CO3
7	LLO4.1Write function to solve given problem.	Write a user define function to implement following features: 1. Function without argument 2. Function with argument 3. Function returning value	2	CO4
8	LLO4.2Write python program to Create function by selecting appropriate type of argument.	*Implement user defined function for given problem: 1. Function positional/required argument 2. Function with keyword argument 3. Function with default argument 4. Function with variable length argument	2	CO4

9	LLO4.3Write python program using anonymous function. LLO4.4Write python program to use function in argument.	Write Python program to demonstrate use of following advanced functions: 1. lambda 2. map 3. reduce	2	CO4
10	LLO4.5Write user defined module to solve given problem.	Write a python program to create and use a user defined module for a given problem.	2	CO4
11	LLO4.6 Select appropriate module to solve given problem. LLO4.7 Use given module to solve problem.	Write a python program to demonstrate the use of following module: 1. math module 2. random module 3. os module	2	CO4
12	LLO5.1Write python program to perform operations on list.	*Implement a python program to perform following operations on the List: 1. Create a List 2. Access List 3. Update List 4. Delete List	2	CO5
13	LLO5.2Write python program to use built-in functions on list.	Implement Python program to demonstrate The use of built-in functions/methods on List (Any Eight Functions/methods)	2	CO5
14	LLO5.3Write python program to perform operations on tuple.	*Implement python program to perform following operations on the Tuple: 1. Create a Tuple 2. Access Tuple 3. Print Tuple 4. Delete Tuple 5. Convert tuple into list and vice-versa	2	CO5
15	LLO5.4Write python program to manipulate the set.	*Implement a python program to perform following operations on the Set: 1. Create a Set 2. Access Set 3. Update Set 4. Delete Set	2	CO5
16	LLO5.6 Use built-in functions/methods on sets in python for solving given problems.	Implement a python program to perform following functions on Set: 1. Union 2. Intersection 3. Difference 4. Symmetric Difference	2	CO5
17	LLO5.7Write python program to perform operations on dictionary.	*Implement a python program to perform following operations on the Dictionary: 1. Create a Dictionary 2. Access Dictionary 3. Update Dictionary 4. Delete Dictionary 5. Looping through Dictionary 6. Create Dictionary from list	2	CO5

18	LLO 6.1 Develop program for Python file handling.	1.Binary File Handling 2.Use file modes 3.Use file methods	**2**	CO6
19	LLO 6.2 Develop program for Python read files.	1.Reading to Text Files 2.Counting Words in a Text File	**2**	CO6
20	LLO 6.3 Develop program for Python write/create files	1.Reading and Writing to Text Files 2.Appending Data to a File	**2**	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the Virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, online coding contests on websites like hacker rank, Code chef etc.
- At the institution level, encourage students to start a coding club.
- Mini-Project: Develop a mini project using Python Programming.

Self Learning

- Students are encouraged to register themselves in various MOOC's such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note :

Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.

The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

If a micro project is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.

For courses with no SLA component the list of suggestive micro projects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer System (Any computer system with basic configuration)	All
2	Python Interpreter / IDE (Any open source python distribution such as anaconda etc) (Any open source IDE such IDLE, Jupyter Notebook, Spyder, PyCharmetc)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Python and Its Basics	CO1	12	5	5	5	15
2	II	Python Data Types and It's Use	CO2	9	2	4	4	10
3	III	Python Program Flow Control Statements	CO3	9	2	4	4	10
4	IV	Python Functions, Modules and Package	CO4	9	2	4	4	10
5	V	Python Data structures: String, List, Dictionary and Set Manipulations	CO5	9	2	4	4	10
6	VI	Python File Handling and Operations	CO6	12	5	5	5	15
Grand Total				**60**	**18**	**26**	**26**	**70**

I) ASSESMENT TOOL –

- **Formative assessment**
  Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 1) 60% weightage is to process 2) 40% weightage to product
- **Summative Assessment**
  End Semester Examination, Lab Performance, Viva-voice

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	# R. Nageswara Rao	Core Python Programming	Dreamtech Press, ISBN-13:9789390457151
2	Mark Lutz	Learning Python	O'Reilly Media, Inc, ISBN: 9781449355739
3	David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler	Python Basics	Real Python, ISBN-13: 9781775093329
4	Dr .Jeeva Jose	Taming Python by Programming	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN: 9789386173348
5	Rupesh Nasre	Python Programming	AICTE, ISBN 9788195986354 [Online available on AICTE e-Kumbh]

- **WEBSITES LINKS**

Sr. No.	Link / Portal	Description
1	https://ekumbh.aicte-india.org/allbook.php	Python Programming
2	https://python-iitk.vlabs.ac.in/	Python Programming Lab
3	https://spoken-tutorial.org/watch/Python+3.4.3/Input-output/English/	Introduction to Python and control flow statements, Data

		Structures in Python, Function and module
4	https://onlinecourses.nptel.ac.in/noc19_cs41/preview	Python Programming Course
5	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094439793500160259 2_shared/overview	Python for Beginners
6	https://www.geeksforgeeks.org/python-gui-tkinter/	Python GUI Programming
7	https://www.w3schools.com/python/python_mysql_getstarted.asp	Python My SQL Database Connectivity
8	https://www.tutorialspoint.com/python_pandas/index.htm	Python pandas package
9	https://www.programiz.com/python-programming/object-oriented -programming	OOP using Python1
10	https://www.geeksforgeeks.org/file-handling-python/	Python File Handling

Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

Course Outcomes (COs)	PO-1Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO- 3
CO1	2	1	1	1	-	-	1	-	2	-
CO2	2	1	1	1	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-
CO4	3	3	3	2	-	-	1	-	-	-
CO5	3	2	3	3	-	-	1	-	-	-
CO6	1	2	2	2	-	-	1	-	2	-

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Java Programming
Course code	R23CP1404
Course Category	AEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Java is platform independent, open-source object-oriented programming language and used for web applications due to its simplicity, portability & security. Java has the broad industry support and is prerequisite with many allied technologies like Java Server Pages, Android Application Development. This course provides the basic foundation for developing simple java applications.

B) EXPECTED SKILL/s –

Develop standalone and network-based applications using Java.

C) COURSE OUTCOMES (COs)

The students will be able to

1. Understand features of OOPs, Language constructs, JDK toolkit.
2. Write programs using class, objects, methods and constructors.
3. Implement the interfaces: Multiple inheritance in programs, create and use packages.
4. Handle exceptions and Create multithreaded programs.
5. Implementing Collection Framework, use stream I/O, and perform file operations.
6. Design applet and graphics programs.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**1.1 Java Evolution:-** Java History, Java Features, Java Environment. **1.2 Overview of Java Language:-** Introduction, Simple Java Program, An Application with Two Classes, Java Program Structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine (JVM), Command Line Arguments. **1.3 Constants, Variables, And Data Types -** Constants, Variables, Data Types, Declaration of Variables, giving values to variables, Scope Of Variables, symbolic constants, getting values of variables **1.4 Operators and expressions** different types of operators and expressions **1.5 Decision making, Branching and Looping: -** if statement (types), switch statement, conditional operator, while loop, do-while loop, for loop, break and continue.	**Understand features of OOPs, Language constructs, JDK toolkit.**	**8**	**10**	**CO1**
2	**2.1 Classes , Objects and Methods** Defining a class, fields declaration, methods declaration, creating objects, accessing class members, constructors, method overloading, static members, inheritance : extending a class, overriding methods, final variables and methods, final classes, finalized methods , abstract methods and classes, dynamic method dispatch, visibility control. **2.2 Arrays, Strings and Vectors:-** Introduction of Arrays: ONE Dimensional Arrays, Creating an Array, TWO Dimensional Arrays, Strings, String Arrays, String Methods, String buffer class, vectors, wrapper classes	**Write programs using class, objects, methods and constructors**	**9**	**15**	**CO2**

3	**3.1Interfaces: Multiple Inheritance** Introduction, defining an Interface, extending interfaces, implementing interfaces, accessing interface variables. **3.2 Packages :** Java API Packages , using system packages, naming conventions, Creating packages, accessing a package, using a package, adding a class to a package, hiding classes.	**Implement the interfaces: Multiple inheritance in programs, create and use packages**	**7**	**10**	**CO3**
4	**4.1Errors and Exception Handling :** Introduction , Types of errors, exceptions, syntax of Handling exception, finally statement , throwing our own exceptions **4.2 Multithreading :** Introduction, creating threads, extending the thread class, stopping and blocking a thread, life cycle of thread, using thread methods, thread exceptions, thread priority, synchronization, Implementing the Runnable interface, inter thread communication	**Handle exceptions and Errors, Create multithreaded programs.**	**7**	**10**	**CO4**
5	**5.1 Collection Framework :** Introduction, overview of interfaces- Collection interface, Set Interface, List Interface, SortedSet Interface, Queue Interface, Map Interface, SortedMap Interface, Iterator Interfaceoverview of classes –AbstractCollection Class, AbstractList Class, ArrayList Class,LinkedList Class, stack class, Vector class. **5.2 Streams And File I/O :** Introduction, Concept of streams, stream classes,Byte stream classes: input stream classes, output stream classes, methods of input stream and output stream classes, Character stream classes: Reader stream classes, Writer stream classes, Using Streams, Other useful I/O Classes, use of FILE class, Input/ output Exceptions, creating a files, opening a file,	**Implementing Collection Framework, use stream I/O, and perform file operations**	**6**	**10**	**CO5**

	closing a file, reading bytes from a file, storing bytes to a file, random access files, Reading / Writing characters, Reading / Writing bytes.				
6	**6.1 AWT:** Introduction to AWT Package, Window Fundamentals: Components: Container: window, panel, frame, canvas, Button, label, Check boxes, menu bars and menus, Closing an AWT window or frame: Applet life cycle,Using the Graphics class, drawing arcs and ellipses, Working with applets, Working with Fonts, Layout managers: flow layout, border layout, grid layout, Handling Events on AWT Components: extending button, extending checkbox, extending choice, extending list. **6.2 JDBC :** Introduction, JDBC Architecture: Driver Manager, Different Type of JDBC Drivers: Type1, Type2, Type3, Type4, Which Driver should be used ?, connection, statement,7 Steps for JDBC application, Overview of JDBC Components: JDBC Driver, Connection, Statement.	**Design AWT and JDBC programs**	**8**	**15**	**CO6**

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	a. Setup Java Programming development environment using: Command prompt.(Class path and path setup), Any IDE.	LLO 1.1 Install any IDE software application.	**2**	**CO1**

	b. Write programs to use different types of operators and expressions.	LLO 1.2 Develop program to use different types of operators and expressions		
2.	Write programs to demonstrate use of: 1. if statements (all forms of if statement) 2. Switch – Case statement 3. Different types of Loops (for, while and do..While).	LLO 2.1 Develop program to implement different control structures.	**2**	**CO1**
3.	a. Write program for implementation methods of:i) String class, ii) StringBuffer class. b. Write programs to demonstrate use of i) Array, ii) Vectors.	LLO 3.1 Develop program to implement different control structures. LLO 3.2 Implement array and vectors in Java.	**4**	**CO2**
4.	Write a program for implementation of: 1. Method overloading, 2. Final variables, methods, classes. 3. Dynamic method dispatch	LLO 4.1 Implement, method overloading, final variables, methods, classes, dynamic method dispatchin Java.	**4**	**CO2**
5.	Write programs using Wrapper Class to convert : 1. Primitive data type into object. 2. Object into primitive data type.	LLO 5.1 Convert primitive data types into object and vice-versa.	**2**	**CO2**
6.	Develop program for implementation of interface.	LLO 6.1 Implement multiple inheritances.	**2**	**CO3**
7.	Write programs to demonstrate use of : 1. Built in packages. 2. User defined packages.	LLO 7.1 Implement packages in Java.	**2**	**CO3**
8.	Write programs for implementation of Inbuilt & User Define Exception using Try catch and finally block &Throw, throws clause.	LLO 8.1 Implement inbuilt and user-defined exceptions using try-catch-finally blocks and the throw and throws clauses to handle various error types effectively in Java.	**2**	**CO4**
9.	Write programs using multithreading.	LLO 9.1 Execute different processes simultaneously using multithreading.	**2**	**CO4**
10	Program using Collection interface.	LLO 10.1ImplementCollection interface in Java.	**2**	**CO5**

11	Write a Java program to perform file operations: read, write, copy content from one file to another, write bytes using FileOutputStream, and read bytes using FileInputStream.	LLO 11.1Execute different file operations including reading, writing, copying file content, writing bytes using FileOutputStream, and reading bytes using FileInputStream in Java.	**2**	**CO5**
12	Write a Java program using AWT to create a simple GUI with a label, text field, button, and display a greeting message on button click.	LLO 12.1Implement AWT components and event handling to create interactive GUI applications in Java.	**2**	**CO6**
13	Write a Java program using JDBC to connect to anAny database and retrieve all records from the student_info table.	LLO 13.1Establish a database connection using JDBC and retrieve records using SQL queries in Java.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Mini project

- Develop mini-ATM machine system. It should accept account_no, account_holder_name, account_balance and perform operations such as withdrawal, Deposit and balance check.
- Develop Quiz Management System. Quiz should accept student credentials and contain 10 MCQ type questions. Determine the final result. Save the result in table along with student credentials.
- Energy Billing System: Expected to develop bill amount module based on usage of energy consumption.
- Develop Employee Management System. Insert employee details such as employee_name, emp_id,emp_salary etc.. into database and retrieve data from table.
- Any other micro project as suggested by course teacher.

Assignment

- Solve assignment covering all COs given by teacher

Other

- Complete any course of Java Programming on Infosys Springboard/Spoken Tutorial/NPTEL
- Develop java code for given problem suggested by course teacher

Note:

- Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All
2	"JAVA" Compiler (Any)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Java Evolution, Overview of Java Language, Constants, Variables, Data Types, Operators, expressions, Decision making, Branching and Looping.	8	3	4	3	10
2.	Classes, Objects, Methods, Arrays, Strings and Vectors.	9	3	6	6	15
3.	Interfaces: Multiple Inheritance, Packages.	7	3	4	3	10
4.	Errors and Exception Handling, Multithreading	7	3	4	3	10
5.	Collection Framework Streams And File I/O	6	3	6	6	10
6.	AWT& JDBC	8	3	4	3	15
		45	18	28	24	70

I) ASSESMENT TOOL –

- **Formative assessment**
  1) Continuous assessment based on process and product related performance indicators
  2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
  3) A continuous assessment-based term work

- **Summative Assessment**
  3) End semester examination, Lab performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	# E. Balagurusamy	Programming With Java	Tata McGraw Hill, 6thEdition, 2023
2	# Herbert Schildt	Java Complete Reference – Java 2	Tata McGraw Hill, 7thEdition, 2006
3	Joseph L Weber	Using Java 2	PHI (Eastern Economy Edition), 2002

- **WEBSITES LINKS**

Sr.No.	Link / Portal
1	http://www.freejavaguide.com/
2	http://www.sun.com/
3	http://java.sun.com/docs/books/tutorial/
4	http://www.freejavaguide.com/
5	http://www.leepoint.net/notes-java/index.html

Note: Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO Matrix –

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

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Entrepreneurship Development & Marketing Management
Course code	R23CP6405
Course Category	SEC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme												
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	-	4	2	-	-	-	-	-	25	10	-	-	-	-	25

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This syllabus is designed to equip students with comprehensive knowledge and practical skills in entrepreneurship, business management, and marketing. The structured modules provide a step-by-step approach to developing entrepreneurial competencies, identifying business opportunities, and formulating business plans. Key aspects such as government support, financial planning, and market strategies ensure a well-rounded understanding of business operations.
Furthermore, the inclusion of marketing management, international marketing, and digital marketing prepares students to navigate competitive business environments, leverage technology for business growth, and expand into global markets. By integrating traditional and modern marketing techniques, including AI-driven strategies, this syllabus fosters innovative thinking and strategic decision-making essential for business success.

B) EXPECTED SKILL/s –

Entrepreneurial mindset, business planning, marketing strategies, financial management, digital marketing expertise, analytical thinking, and innovation.

C) COURSE OUTCOMES (COs)

1. Explain the basic concepts of entrepreneurship, motivation, creativity, and innovation.
2. Identify business opportunities and perform basic SWOT analysis.
3. Describe government support schemes and prepare a simple business plan.

4. Explain basic marketing concepts and understand consumer behaviour.
5. Apply basic marketing techniques such as pricing, branding, and promotion.
6. Use basic digital marketing methods like social media, SEO, and online advertising.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**1.1 Introduction and Entrepreneurial Competencies:** - Definition of entrepreneur, concept of entrepreneur and entrepreneurship, importance of entrepreneur. Types of entrepreneurs: Difference between Entrepreneur and Intrapreneur. - Characteristics of an entrepreneur, qualities of an entrepreneur, competencies of entrepreneur. **1.2**. **Motivation:** Definition and concept of motivation, types of motivation: affiliation, power, and achievement motivation. **1.3Creativity and Innovation:** Definition and concept of Innovation, definition and concept of Creativity. Characteristics of creative people.	1.1 Explain entrepreneur and entrepreneurship 1.2 State characteristics of entrepreneur 1.3 Differentiate entrepreneur and intrapreneur 1.4 Explain motivation and its types 1.5 Explain innovation and creativity	**05**		**CO1**
2	**Business Opportunity Identification and Idea Development** **2.1 Business Opportunity Search and Scanning:** Opportunities available in different sectors such as manufacturing, services and trading. Classification of opportunities on the following: -Natural resource based, Demand based, Local industrial based, Service sector based, Export based, Skill based, Off-farm based. **2.2 Business Idea and Sources of Business Idea:** Search for business idea, sources of business idea, ways of generating ideas, ideas processing & selection (factors affecting product idea). SWOT Analysis. - Market survey & techniques, prospective consumers, development in other nation, study of project profile, government organization.	2.1 Apply creativity in generating business ideas 2.2 Describe characteristics of creative people 2.3 Give examples of innovation and creativity 2.4 Explain business opportunities 2.5 Classify business opportunities 2.6 Explain idea generation process 2.7 State sources of business ideas	**05**		**CO2**

3	**Government Support, Funding, and Business Plan Development** **3.1 Government and Non-government Agencies for Promotion and Development:** Importance of funds, Types of funds. Various schemes of assistance of the government, Government policies and incentives. **3.2 Business Plan Preparation:** Project identification, project formulation, feasibility analysis, Estimation of cost of production, Cost volume profit relationship at different levels, Interpretation of financial statements.	3.1 Describe government support agencies 3.2 State importance of funds and schemes 3.3 Explain SSI and ancillary units 3.4 Explain business plan concept 3.5 Describe project formulation 3.6 State sources of capital.	**05**		**CO3**
4	**4.1 Introduction to Marketing Management:** Fundamentals of Marketing, Sales v/s Marketing , Basic Concepts : Segmentation, Targeting, and Positioning (STP), Types of Products & Services. B2B and B2C, The product – service continuum. Customer – Value Hierarchy or Levels of Product. Types of Markets - The Pull and the Push Methods, Marketing –Mix - 4 P's of Marketing (Product, price, place, and promotion), **3** P's of Services (People, Process, Physical Evidence **)** **4.2 Marketing Environment :** Macro & Micro Environmental factors ,Product Life Cycle **4.2.1 Consumer Behaviour** The buying process , The difference between B2B buying and B2C buying	4.1 Explain marketing environment 4.2 Explain product life cycle 4.3 Describe consumer buying process	**06**		**CO4**
5	**5.1 (Price / Place & Promotion)** Pricing – factors affecting pricing decisions. Pricing strategies , Distribution design & Types of Intermediaries - Promotion-mix / Communication –Mix **5.2 Market Planning:** Branding and Brand Management : Image Building . Brand Positioning, Step by Step Planning process. (including Forecasting and implementation) , Advertising & Marketing : Case Study	5.1 Explain basic concepts of international marketing 5.2 Describe market entry methods	**05**		**CO5**

	5.3. International Marketing : International Marketing- Setting Objectives & Deciding Policies (opportunities and Challenges) , Organization structure , Entry Modes into new International Markets				
6	**Digital Marketing:** Establishing a digital presence, Search Engine Optimization (SEO), Content Marketing. Web Analytics, Social Media Optimization (SMO), Search Engine Marketing (SEM), E-Mail Marketing (E-marketing) & Mobile SEO , AI : Its use in Marketing and in Business	6.1 Explain basic digital marketing methods	**04**		**CO6**

E) PRACTICAL (BASED ON LLO'& TLO) ASSESSMENT WORK – Any 10

Sr. No	**Laboratory Experiment / Practical Titles / Tutorial Titles**	**Practical / Tutorial / Laboratory Learning Outcome (LLO)**	**Number of hrs**	**Relevant COs**
1	Prepare a report on Biography of any entrepreneur	Prepare a report on the life and achievements of an entrepreneur	2	**CO1**
2	Self Disclosure Exercise (Who am I?)	Market yourself as a able professional Engineer and Marketing and entrepreneurs	2	**CO1**
3	Prepare a Mind Map for Self evaluation	Mind map will help to reflect on their personal strengths, weaknesses, opportunities for growth, and areas needing improvement, thereby enhancing their self-awareness and critical thinking skills.	2	**CO2**
4	SWOT Analysis taking into consideration as an Entrepreneur and Marketing Manager.	Considering any profession, situation given by the trainer.	2	**CO2,CO4**

5	Self rating questionnaire to evaluate entrepreneurial traits and identify improvement areas	Assess and identify areas for improvement in entrepreneurial traits through a self-assessment.	2	**CO3**
6	Conduct a brainstorming session (group discussion) for students to generate business ideas and prepare a business plan	Group will propose the business idea and business plan	2	**CO3**
7	Select a brand, analyze its marketing strategy using the 4 P's, and create a report on the effectiveness of its marketing mix. Analyze a brand's marketing strategy using the 4 P's and assess the effectiveness of its marketing mix.	Analyze a brand's marketing strategy using the 4 P's and assess the effectiveness of its marketing mix.	4	**CO4**
8	Propose an international marketing strategy for a product, considering cultural differences, legal factors, and regulations.	Prepare The marketing strategy for a product		
9	Conduct a market survey to gather data on consumer preferences, demand, and competition, strategy used for product marketing, then analyze it to validate their business idea.	Conduct a market survey and analyze data to validate a business idea.	4	**CO5**
10	Prepare a flyer / Pamphlet / digital advertisement for any marketing of any product / service	Understand the use of Digital marketing	2	**CO6**

F) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computers with internet and printer facility	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

-

I) ASSESSMENT TOOL –

- Formative assessment (Assessment for Learning)
  - Assessment during practicals
- Project-Based Assessment
  - Preparation of Startup Report (AIC Model)

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No	Author	Title	Publisher with ISBN Number
1	Vasant Desai	Dynamics of Entrepreneurial Development And Management	Himalaya Publishing House,1997, Reprint-1999
2	Dilip M. Sarwate	Entrepreneurial Development Concept and Practices	Everest Publishing House,1996
3	Kotler Philip	Marketing Management 11 th Edition	Pearson Education India
4	Dr. V.O. Vorkey	A Handbook on Marketing Management	Everest Publishers, Pune

- **WEBSITES LINKS**

Sr.No.	Link / Portal	Description
1	https://www.tutorialspoint.com/marketing_management/	Marketing management concepts.
2	https://www.studocu.com/en/document/university-of-connecticut/intro-to-marketing-management/lecture-notes/lecture-notes-complete-revision-introduction-to-marketing-management/686989/view	Marketing management principles.
3	https://www.slideshare.net/	Platform for sharing and accessing presentations, case studies, and insights on various marketing topics.
4	WWW.Bookboon.com	Management and business strategies.

Note: Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

Course Outcomes (Cos)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society , Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	-	-	1	-	2	-	1	1
CO2	2	3	2	-	1	-	2	1	-	-
CO3	2	2	2	-	1	2	2	1	-	-
CO4	3	2	2	-	1	-	2	2	-	-
CO5	2	2	3	-	1	2	2	2	-	-
CO6	2	1	2	-	1	-	2	2	-	-

Legends :- High: 03, Medium: 02, Low: 01, No Mapping : -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Ethics in Engineering Practice
Course code	R23CP4403
Course Category	VEC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	-	2	4	2	-	-	-	-	-	-	-	-	-	25	10	25

Abbreviations:
CL-Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

A) RATIONALE

This course develops ethical awareness and moral reasoning in engineering students. It helps them understand professional responsibilities, make ethical decisions, and address real-world issues related to society, environment, and technology.

.

B) EXPECTED SKILL/s –

The expected skill set of this course is to enable students to attain the following Industry Identified Outcome through various teaching-learning experiences. **Apply ethical principles, professional standards, and moral reasoning to analyze, evaluate, and resolve ethical issues in engineering practice, ensuring responsible decision-making, social accountability, and sustainable development in real-world scenarios.**

C) COURSE OUTCOMES (COs)

The students will able to-

1. Apply ethical reasoning and distinguish between ethics, morals, and laws in engineering practice.
2. Analyze professional codes of conduct and evaluate ethical responsibilities towards society, employer, and clients.
3. Explain ethical issues in engineering design, including risk, safety, and decision-making under uncer tainty.
4. Elaborate professional responsibilities such as accountability, whistleblowing, and conflict of interest in workplace scenarios.

5. Interpret ethical concerns in computing, including data privacy, cyber security, and intellectual property rights.

6. Identify environmental, workplace, and sustainability issues and demonstrate ethical responsibility in real-world engineering situations.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Introduction to Ethical Reasoning and Engineering Ethics** **1.1** Ethics, morals, and laws – meaning and difference **1.2** Scope and importance of engineering ethics; need for ethics **1.3** Ethical dilemmas, moral conflicts, self vs public views. **1.4** Ethical theories & decision-making models + case study	**TLO 1.1:** Compare ethics, morals, and laws. **TLO 1.2:** Explain scope and importance of engineering ethics. **TLO 1.3:** Analyze ethical dilemmas and self vs public views. **TLO 1.4:** Apply ethical theories and decision-making models.	**6**	**10**	**CO 1**
2	**Professional Practice in Engineering** **2.1** Engineering as a profession; characteristics of engineers **2.2** Professional vs personal ethics; code ethics (IEEE, ACM, etc.) **2.3** Professional competence, lifelong learning, honesty, integrity **2.4** Negligence, misconduct, responsibil + case study	**TLO 2.1:** Explain engineering as a profession and characteristics of engineers. **TLO 2.2:** a) ompare professional and personal ethics; identify codes of ethics (IEEE, ACM). **b)** Explain professional competence, lifelong learning, honesty, and integrity.. **c)** Analyze negligence, misconduct, and responsibilities using case studies.	**8**	**15**	**CO 2**

3	**Professional Practice in Engineering** **3.1** Ethics in engineering design; moral problems **3.2** Value-sensitive design; human-centered design **3.3** Risk, safety, and uncertainty **3.4** Cost–benefit analysis; safety standards **3.5** Socially responsible design + case study	**TLO 3.1:** Explain ethics in engineering design and moral problems. **TLO 3.2:** Compare value-sensitive and human-centered design. **TLO 3.3:** Analyze risk, safety, and uncertainty. **TLO 3.4:** Evaluate cost–benefit analysis and safety standards.. **TLO 3.5:** Apply socially responsible design using case studies.	**8**	**10**	**CO 3**
4	**Central Professional Responsibilites** **4.1** Responsibility to public safety, health, welfare **4.2** Responsibility to employer, client, colleagues **4.3** Whistleblowing; conflict of interest **4.4** Accountability, liability, leadership + case study	**TLO 4.1:** Explain responsibility towards public safety, health, and welfare.. **TLO 4.2:** Explain responsibility towards employer, client, and colleagues. **TLO 4.3:** Analyze whistleblowing and conflict of interest. **TLO 4.4:** Evaluate accountability, liability, and leadership using case studies.	**8**	**15**	**CO 4**
5	**Computers, Software, and Intellectual Property** **5.1** Ethics in computing and IT **5.2** Software reliability, quality, Safety **5.3** Cybersecurity, cybercrime, data privacy **5.4** AI, automation, big data ethics **5.5** IPR, piracy, plagiarism + case study	**TLO 5.1:** Explain ethics in computing and IT. **TLO 5.2:** Explain software reliability, quality, and safety. **TLO 5.3:** Analyze cybersecurity, cybercrime, and data privacy. **TLO 5.4:** Evaluate ethical issues in AI, automation, and big data. **TLO 5.5:** Apply IPR concepts, piracy, and plagiarism using case studies..	**7**	**10**	**CO 5**

6	**Workplace and Environmental Responsibilitiess** **6.1** Employee rights; employer obligations **6.3** Health, safety, teamwork, culture **6.4** Environmental ethics; pollution, waste management **6.5** SDGs, role of engineers + case study & revision	**TLO 6.1:** Explain employee rights and employer obligations.. **TLO 6.2:** Explain health, safety, teamwork, and organizational culture. **TLO 6.3:** Analyze environmental ethics, pollution, and waste management.. **TLO 6.4:** Evaluate SDGs and role of engineers using case studies. **TLO 6.5:** Apply SDGs and role of engineers using case studies	8	**10**	**CO 6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

F) SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/SKILLS DEVELOPMENT(SELFLEARNING)

Assignment

- Case studies on relevant topics.

G) LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Ethical Reasoning and Engineering Ethics	1	5	3	5	2	10
2	II	Professional Practice in Engineering	2	5	3	5	2	10
3	III	Ethics as Design – Moral Problems	3	5	3	5	2	10
4	IV	Central Professional Responsibilities	4	5	3	5	2	10
5	V	Computers, Software, and Intellectual Property	5	6	4	5	1	15
6	VI	Workplace and Environmental Responsibilities	6	6	4	5	1	15

I) SUGGESTEDLEARNINGMATERIALS/BOOKS

Sr. No.	Title of Book	Author	Publication (with year)
1	Ethics in Engineering	Mike W. Martin, Roland Schinzinger	McGraw-Hill, 2010
2	Ethics in Engineering Practice and Research	Caroline Whitbeck	Cambridge University Press, 2011
3	Engineering Ethics	Govindarajan M., Natarajan S., Senthil Kumar V.S.	PHI Learning, 2009
4	Engineering Ethics	Charles B. Fleddermann	Pearson Education, 2012

J) WEBSITES LINKS

Sr. No	Link/Portal	Description
1	http://www.nspe.org	Offers codes of ethics, guidelines, and examples related to professional engineering practices.
2	http://onlineethics.org	Provides case studies, videos, and resources to understand real-world ethical issues in engineering.
3	http://researchguides.case.edu/engethics	Includes books, articles, and professional ethics codes useful for academic study.

K) CO-PO-PSO MATRIX

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO1	PSO2	PSO3
CO1	2	-	1	1	1	-	1	1	-	-
CO2	3	2	1	1	-	-	1	-	-	-
CO3	3	1	-	1	-	-	-	-	-	-
CO4	2	1	2	2	1	-	-	-	-	-
CO5	3	2	2	2	1	-	1	1	-	-
CO6	2	2	2	2	2	-	1	1	-	-

Legends: -High:03, Medium:02, Low:01, No Mapping: -

Modern Education Society's

Cusrow Wadia Institute of Technology, Pune

Learning and Assessment Scheme for Post S.S.C Diploma Courses MPECS R23 (Based on National Education Policy 2020)

PROGRAMME NAME: DIPLOMA IN COMPUTER ENGINEERING

PROGRAMME CODE:CO	**WITH EFFECT FROM ACADEMIC YEAR: 2024-25**
DURATION OF PROGRAMME: 6 Semesters	**EXIT SCHEME - SECOND YEAR**
YEAR EXIT: NCrF LEVEL 3.5	**SCHEME: R23**

Sr. No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for sem.	Learning Scheme					Credits	Assessment Scheme											
						Actual Hrs./Week			Self-Learning (Assignment/ Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				(Based on LL & TL)				Based on Self Learning		Total Marks
																	Practical						
													FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
						CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
General (Any - One)																							
1	**INDUSTRIAL TRAINING (FULL TIME)**	**EXIT**	**INP**	**R23CP5404**	**-**	**-**	**-**	**-**	**-**	**0**	**4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**50@**	**20**	**-**	**-**	**50**
2	**SECOND YEAR EXIT COURSE (ONLINE)**	**SYEC**	**SEC**	**R23CP6408**	**-**	**-**	**-**	**-**	**-**	**0**	**4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**50@**	**20**	**-**	**-**	**50**
TOTAL					**0**	**0**	**0**	**0**	**0**	0	**4**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**50**	**20**	**0**	0	**50**

Abbreviations :

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note:

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.

Course Category : Ability Enhancement Course (AEC) : , Discipline Specific Course Core (DSC) : , Discipline Specific Elective (DSE) : , Value Education Course (VEC) : , Internship/Apprentice/Project./Community (INP) : Skill Enhancement Course (SEC): , Generic Elective (GE) :

SEMESTER V

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Software Engineering
Course code	R23CP2409
Course Category	DSC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

This course is intended to provide the students with an overall view of Software Engineering with insight in to the processes of software development. Software Engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software. The discipline of Software Engineering encompasses knowledge, tools, and methods for defining software requirements, and performing software design, software construction, software testing, and software maintenance tasks.

B) EXPECTED SKILL/s –

Apply software engineering principles to develop software product.

C) COURSE OUTCOMES (COs)

Students will be able to achieve and demonstrate the following COs on completion of course based learning

CO1 - Select suitable software development process model.

CO2 - Prepare software requirement specification.

CO3 - Construct different Software design models.

CO4 - Apply different planning and cost estimation techniques for a software product.

CO5 - Apply project management techniques in software development.

CO6 - Use quality assurance principles in software development.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**1.1 Introduction to software Engineering:** The evolving role of software, Software characteristics, Software applications, Software myths. Generic view of software engineering, Process models – Waterfall model, Incremental process model, RAD model; Evolutionary software process models – Prototyping, Spiral model, Concurrent development model; Specialized Process Models, Personnel and Team Process models; Agile process models - Agile process models, Extreme programming.	**TLO 1.1** Understand the software characteristics **TLO 1.2** Understand application of software **TLO 1.3** Suggest the relevant software solution for the given problem. **TLO 1.4** Select the relevant software process model for the given problem. **TLO 1.5** Suggest the relevant activities in Agile Development Process.	11	10	CO1
2	**2.1 Requirement Engineering:** Requirement engineering, Initialing the process, Eliciting requirement, Building the Analysis Model, Negotiating, Validating requirements. Building Analysis Model: Analysis Modeling Approaches- Data modeling Concept, Object Oriented Analysis, Scenario-Based Analysis, Requirements Modeling strategies, Flow-Oriented Modeling, SRS**.**	**TLO 2.1** Understand the Analysis model. **TLO 2.2** Apply principles of software engineering for the given problem. **TLO 2.3** Write the relevant requirement engineering steps for the given problem. **TLO 2.4** Prepare SRS Document for given problem.	12	15	CO2
3	**3.1 Design Engineering:** Design Process, Design concepts (Abstraction, Modularity, Information hiding, Functional Independence, Refinement), Design model (Data Design, Architecture Design, Interface Design, Component level Design); **3.2 Software architecture- C**ontrol Architecture, Structural Partitioning, Functional Independence (Cohesion and Coupling). **3.3 Architectural styles**: Data centred architectures, Data flow architectures, Call and return architectures, Object oriented architectures, layered architectures.	**TLO 3.1** Identify the elements of analysis model for the given software requirements **TLO 3.2** Apply design concepts and different software architectures. **TLO 3.3** Understand software architectural styles and DFDs.	9	10	CO3
4	**4.1 Software Testing Techniques:** A strategic approach to software testing,	**TLO 4.1**Understand software testing fundamentals	12	15	CO4

	strategic issues, test strategies for conventional software and Object oriented software, validation testing, system testing, The art of debugging. **4.2 Testing Tactics**- Software testing fundamentals, White box testing, basis path testing, Control structure tests, Black box testing. **4.3 Software Quality Assurance-** SQA activities, Software Reviews, FTR	**TLO 4.2**Write test cases for various application software **TLO 4.3** Understand SQA activities and Formal Technical Review			
5	**5.1 Process and project Metrics:** Metrics in process and project domains, software measurement metrics for software quality, **5.2 Estimation for software project:** project planning process, software scope and feasibility, resources, Decomposition Techniques, Empirical Estimation Models, Estimation for Object Oriented project, Make Buy decision.	**TLO 5.1** Explain the management spectrum for software project. **TLO 5.2** Estimate size of software product. **TLO 5.3** Estimate cost of software product using the empirical method. **TLO 5.4** Compute size of the given software using COCOMO model. **TLO 5.5** Apply RMMM strategy in Identified risks for any software development problem.	**10**	**10**	**CO5**
6	**6.1 Risk Management**: Reactive versus proactive Software Risk, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring & Management, The RMMM plan. **6.2 Project Scheduling:** Basic Principles, Defining task set for software project, defining a task network, scheduling (Timeline chart, Tracking the schedule). **6.3 Software Configuration Management**: Software Configuration Management, SCM Repository, SCM process.	**TLO 6.1** Apply RMMM strategy in Identified risks for any software development problem. **TLO 6.2** Understand project scheduling and Software configuration management process.	**10**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	**2**	Requirement analysis for the given software application	**4**

2	**2**	Creation of data dictionary for given software application.	**4**
3	**2**	Draw E-R diagram for the given software system.	**4**
4	**2**	Convert E-R diagram to database tables.	**4**
5	**3**	Draw use-case diagram for given software application.	**4**
6	**3**	Draw data flow diagram up to level 3 for the given software application.	**4**
7	**4**	Write Test cases for software application.	**4**
8	**1-6**	Use of Jira Board for Software Project Management.	**4**
Total			**32**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Micro project

- Apply the principles of software engineering for Portfolio website for showcasing Skills and Work, Search ability and Online Presence, Demonstrating Growth and Progress, Career Advancement and Networking and Prepare complete technical document.
- Apply the principles of software engineering for Chabot Application to create an intelligent Chabot to enhance customer support processes, providing efficient and personalized assistance and Develop technical document.
- Apply the principles of software engineering for Online Chat Application Project that enables users to exchange messages and communicate with each other in real-time. It allows individuals or groups to have conversations, share information, and collaborate instantly over the Internet. Online Chat Application is designed to provide a responsive and interactive experience, where messages are delivered and displayed immediately as they are sent and Prepare complete technical document.

Assignment

- Estimate Cost of software using any tool and risk involved in the library Management System.
- Create DFDs, Activity Diagram, ER-Diagrams for Student Management System.
- Visit any medical shop and collect requirements from shop keeper and create SRS document

Note: Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way. The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills. If a micro project is assigned, it is expected to be completed as a group activity.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Software Project Management Tools: Open source Software such as Jira.	All
2	Software Design tools : Project risk manager	All
3	Software Design tools :Open Project, Gantt project 3.3	All

4	Software Design tools: Free Use Case Diagram Creator	All
5	Software Design tools: Draw.io, Decision Table Maker, Tiny tools	All
6	Hardware: Personal computer,processori3 and above, RAM minimum 4GB	All
7	Operating system:Windows10 and above	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to software Engineering	**11**	5	5	-	10
2	Requirement Engineering	**12**	6	9	-	15
3	Design Engineering	**9**	4	4	2	10
4	Software Testing Techniques	**12**	5	5	5	15
5	Process and project Metrics, Software project estimation	**10**	5	5	-	10
6	Risk management and project scheduling	**10**	5	5	-	10
	Total	**64**	30	33	07	70

I) ASSESMENT TOOL –

- **Formative assessment**
  1. Each practical will be assessed considering 60% weightage to process, 40% weightage to product.
  2. Continuous assessment based on process and product related performance indicators.
  3. A Continuous assessment -based term work.

1) Summative Assessment

1. End Semester Examination, Lab Performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	#Roger S. Pressman & Bruce R. Maxim	Software Engineering, a practitioner‘s approach	McGraw-Hill Publication, 9th Edition, 2023
2	Douglas Bell	Software Engineering for Students A Programming Approach	Addison Wesley, 4th Edition, 2005
3	Ron Patton	Software Testing	Sams Publishing, 2nd edition, 2005

- **WEBSITES LINKS**

Sr.No	Link / Portal	Description
1	https://www.geeksforgeeks.org/software-engineering-introduct ion-to-software-engineering/	Software engineering tutorials from Geeksforgeeks
2	https://www.tutorialspoint.com/software_engineering/index.htm	Software Engineering Tutorials
3	https://www.sei.cmu.edu/	Software Engineering Institute
4	https://www.youtube.com/watch?v=WjwEh15M5Rw	Agile Methodology
5	https://app.diagrams.net/	Software Design- DFDs, Class Diagrams, Use Case Diagrams
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

K) CO-PO-PSO Matrix –

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

Legends:-High:03, Medium:02, Low:01, No Mapping

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Advanced Java Programming
Course code	R23CP1405
Course Category	AEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This course uses the Java language to develop skills in the design and development of object oriented systems involving significant numbers of objects. Emphasis is placed on the more advanced features of the Java language. This course extends the basic Java language skills to cover more complex object oriented applications. Students gain experience in object oriented design involving multiple classes, and develop multi-level GUI screens. Also covered are interclass relationships, JDBC, RMI, JavaBeans, Client-Server programming and networking

B) EXPECTED SKILL/s –

Develop applications using Advanced Java Programming.

C) COURSE OUTCOMES (COs)

1. Design and develop Java Swing-based GUI applications using various controls and components.
2. Implement event-driven programming and database connectivity using JDBC.
3. Apply networking concepts and develop distributed applications using Java RMI.

4. Develop dynamic web applications using JSP, Servlets, and MVC architecture.
5. Build web applications using Spring Framework, Spring Boot, and RESTful services.
6. Develop and integrate applications using Hibernate ORM and web services (SOAP & REST).

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	1.1 Introduction to Swings:- Swings, Features of Swing, Applications of Java Swing, Difference Between AWT and Swing, JFC, Hierarchy of Java Swing classes, Commonly Used Methods of Component Class, Java Swing Examples - By creating an object of the Frame class (association),By extending the Frame class (inheritance). 1.2 Swing Controls:- JButton, JLabel, JTextField, JTextArea, JCheckbox, JRadioButton, JTable, JList, JScrollBar, JMenuItem&JMenu, JProgressBar, JColorChooser, JToggleButton, JTabbedPane, JDialog, JPanel, JFileChooser, JFrame, JScrollPane, JComponent, JLayeredPane	TLO 1.1Understand the concept, features, and applications of Java Swing, explain Java Foundation Classes (JFC), and differentiate between AWT and Swing. TLO 1.2Identify and use various Swing components and controls such as buttons, labels, text fields, tables, menus, dialogs, panels, and frames to design GUI-based Java applications. TLO 1.3Develop basic Java Swing applications using different approaches such as association (Frame object) and inheritance (extending Frame class).	**8**	**15**	**CO1**
2	2.1 Java Layout Managers:- Introduction, BorderLayout, FlowLayout, GridLayout, CardLayout 2.2 Swing Event Handling:- What is an Event?, Types of Event, Steps Involved in Event Handling, Event Handling Example, EventObject Class, Event Listeners, Event Adapters. 2.3 Java Database Connectivity- Introduction, JDBC Driver and types, Steps to Connect Database in Java, Example to Connect Java Application with Oracle database	TLO 2.1 Understand and apply appropriate layout managers to design structured and responsive user interfaces. TLO 2.2 Understand concept of events and the event delegation model in Java. TLO 2.3 Identify and use different event classes, listeners, and adapter classes in Swing. TLO 2.4 Understand the role and types of JDBC drivers used for database connectivity in Java. TLO 2.5 Develop program to perform basic database operations (insert, update, retrieve) using JDBC.	**6**	**10**	**CO2**
3	3.1 Network Programming : Concept of Network, networking terminologies – IP Address, Protocol, Port number , URL, MAC Address , Socket, connection less and connection oriented communication protocol, Stream Sockets and Datagram	TLO 3.1 Understand core networking concepts such as IP address, protocol, port number. TLO 3.2 URL, MAC address, and sockets. Use classes from the java.net package such as URL,	**6**	**10**	**CO3**

	Sockets, Difference between TCP and UDP, 3.2 Classes for Networking:- The net package, URL Class, URL Connection, Http URL Connection, InetAddress class, Client server architecture, Datagram Socket class, Server Socket class and Socket class. 3.3 Java Remote Method Invocation : Concept, RMI architecture and RMI registry	URL Connection, Http URL Connection, and InetAddress for basic and web-based communication. Implement client-server communication using Socket, Server Socket, and Datagram Socket classes. TLO 3.3 Understand concept and architecture of Java RMI Understand the role of RMI Registry and how remote objects are registered and looked up, Create simple distributed applications using RM			
4	4.1 Servlets : Overview of Servlets, Architecture of the servlet package, The simple Servlet, The Servlet API, Servlet Life cycle 4.2 Java Server Pages Introduction, Advantages, Lifecycle of a JSP Page, MVC in JSP, Creating a simple JSP Page, The Directory structure of JSP, The JSP API. JSP Scripting elements:- Scriptlet tag, Expression tag, Declaration tag, JSP request implicit object:- Request, Response, Config, Implicit Objects, Application, Session, PageContext, Page, Exception. JSP directives:- page directive , include directive , taglib directive. JSP Action Elements:-jsp:forward, jsp:include, jsp:bean Exception Handling in JSP	TLO 4.1 Understand the fundamentals of Java Servlets, including the overview of servlets, architecture of the servlet package, servlet API, simple servlet structure, and the servlet life cycle for handling client–server communication in web applications. TLO 4.2 Understand the concept, structure, directory organization, and lifecycle of Java Server Pages (JSP), including MVC architecture in JSP, and differentiate JSP technology from Servlets for developing dynamic web-based applications.	**8**	**15**	**CO4**
5	5.1 Spring Framework Introduction, Inversion Of Control (IOC) and Dependency Injection, Advantage of Dependency Injection, Advantages of Spring Framework, Spring Modules, Steps to create spring application, Spring Example. 5.2 Spring Boot- Introduction, use Spring Boot Framework, Advantages of Spring Boot, Limitations of Spring Boot, Spring Boot Features, Spring vs. Spring Boot, Spring Boot Architecture. Annotations: @Autowired, @Controller, @Component, @RequestMapping annotations, REST basics(GET/POST) 5.3 Spring MVC –Introduction, Spring Web Model-View-Controller, flow of Spring Web MVC, Advantages of Spring MVC Framework, Spring Web MVC Framework Example, Directory Structure	TLO 5.1 Understand the core principles of the Spring Framework, including Inversion of Control (IoC) and Dependency Injection (DI), and explain the advantages of dependency injection in developing loosely coupled and maintainable Java applications. TLO 5.2 Understand the architecture, modules, and key features of the Spring Framework, including its advantages, and describe the steps involved in creating a basic Spring application with suitable examples. TLO 5.3 Understand the architecture and features of Spring Boot, including its advantages and limitations, explain Spring vs.	**6**	**10**	**CO5**

	of Spring MVC	Spring Boot, and apply Spring Boot concepts to develop simple REST-based applications.			
6	6.1 Hibernate Framework – Introduction, ORM Tool, Java Persistence API (JPA), Advantages of Hibernate Framework, Hibernate Architecture, Elements of Hibernate Architecture, Hibernate Example 6.2 Java Web Services – Introduction, Web Service, Types of Web Services, Web Service Features, Web Service Components, SOAP Web Services (Advantages and Disadvantages), RESTful Web Services (Advantages and Disadvantages), and difference between SOAP and REST web services.	TLO 6.1 Describe the Hibernate Framework, including its introduction, role as an ORM tool, use of Java Persistence API (JPA), advantages, overall architecture, and key elements of Hibernate architecture with a simple example. TLO 6.2 Understand the concept of Java Web Services, including the definition of web services, types of web services, key features, and core components involved in service-oriented and distributed web-based applications.	**6**	**10**	**CO6**

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Swing Frame by Extending JFrame with Basic Controls - JButton, JTextField, JTextArea, JCheckBox, JRadioButton, and JPanel.	LLO1.1 — Design and implement a JFrame-based Swing GUI using JButton, JTextField, JTextArea, JCheckBox, JRadioButton and JPanel, and demonstrate handling basic user actions and event callbacks.	**2**	**CO1**
2.	Swing Frame by Composition with Advanced Controls - JTable, JList, JScrollPane, JMenuBar, JTabbedPane, JColorChooser.	LLO2.1 — Develop a composed Swing application using JTable, JList, JScrollPane, JMenuBar, JTabbedPane and JColorChooser to present, navigate and modify tabular/list data and menus.	**2**	**CO1**
3.	Design and develop a Java Swing application using various layout managers (BorderLayout, FlowLayout, GridLayout, CardLayout) that handles user events through listeners/adapters and performs data insertion and retrieval using JDBC with an Oracle/MySQL database while displaying status messages in the GUI.	LLO3.1 — Build a Swing application that applies multiple layout managers, implements event listeners/adapters, and performs JDBC operations (INSERT/SELECT) to show end-to-end GUI → DB interaction with appropriate status feedback.	**4**	**CO2**
4.	Develop a Java application that demonstrates client-server	LLO4.1 — Implement client-server communication with TCP/UDP sockets and	**2**	**CO3**

	communication using sockets and networking classes (URL, URL Connection, InetAddress) and implements a simple RMI-based distributed system using RMI architecture and registry.	java.net utilities, and create/register a basic RMI remote object to demonstrate remote method invocation and lookup.		
5.	Develop a Java program using JSP directives and action tags.	LLO5.1 — Create JSP pages employing directives and JSP action tags (<jsp:include>, <jsp:forward>, <jsp:useBean>) to build dynamic web pages and component reuse within the MVC flow.	**2**	**CO4**
6.	Develop a Java program using JSP implicit objects.	LLO6.1 — Use JSP implicit objects (request, response, session, application, pageContext) to process form data, manage sessions, and control request/response flow in a web application.	**2**	**CO4**
7.	Create a Spring application (IOC/DI demo using annotations).	LLO7.1 — Develop a Spring application that demonstrates Inversion of Control and Dependency Injection using @Component and @Autowired, and verify injected behaviour via a simple service consumer.	**2**	**CO5**
8.	Create a simple Spring Boot Application with Service and Controller — demonstrate REST calls (GET/POST) and JSON/HTTP headers (test with Postman/curl).	LLO8.1 — Build a Spring Boot REST API using @RestController and @RequestMapping, implement GET and POST endpoints, and test them with Postman/curl including JSON payloads and headers.	**2**	**CO5**
9.	Hibernate (XML / Annotation) and create REST endpoint and SOAP endpoint (compare both).	LLO9.1 — Implement ORM using Hibernate (mapping via XML or annotations), create entity CRUD operations, and expose persistence via REST and SOAP endpoints to compare integration approaches.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) – -

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All
2	“JAVA” Compiler (Any)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to Swings &Swing Controls	8	5	5	5	15
2.	Java Layout Managers & Swing Event Handling	6	3	3	4	10
3.	Network Programming & Classes for Networking & Java Remote Method Invocation	6	3	4	3	10
4.	Servlets & Java Server Pages	8	5	5	5	15
5.	Spring Framework, Spring Boot &Spring MVC	6	3	3	4	10
6.	Hibernate Framework &Java Web Services	6	3	4	3	10
		40	22	24	24	70

I) ASSESMENT TOOL –

2) Formative assessment

- A continuous assessment-based on term work

3) Summative Assessment

- End semester examination, Lab performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	# E. Balagurusamy	Programming With Java	Tata McGraw Hill, 6th Edition, 2023
2	# Herbert Schildt	Java Complete Reference – Java 2	Tata McGraw Hill, 7th Edition, 2006
3	Joseph L Weber	Using Java 2	PHI (Eastern Economy Edition), 2002

- **WEBSITES LINKS**

Sr.No.	Link / Portal
1	https://www.tpointtech.com/java-swing
2	https://cse.iitkgp.ac.in/~dsamanta/java/ch10.htm
3	https://www.tutorialspoint.com/swing/swing_event_handling.htm
4	http://www.freejavaguide.com/
5	http://www.sun.com/
6	http://java.sun.com/docs/books/tutorial/

Sr.No.	Link / Portal
7	http://www.leepoint.net/notes-java/index.html

Note:

Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-POS Matrix –

Course Outcome	Program Outcomes							Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	–	–	1	–	3	–
CO2	3	3	2	3	–	–	1	1	3	–
CO3	3	3	2	2	–	–	1	1	2	–
CO4	3	2	3	2	1	1	1	–	3	1
CO5	3	2	3	3	1	1	2	–	3	1
CO6	3	2	3	3	1	1	2	–	3	2

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer
Course Name	PHP PROGRAMMING
Course code	R23CP1406
Course Category	AEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	4	1	9	3	3	30	70	100	40	25	10	25	10	25	10	175

Abbreviations:
CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

PHP is a popular server-side scripting language used for developing dynamic and database-driven web applications. This course introduces PHP fundamentals, object-oriented programming, form handling, file handling, and database connectivity using MySQL.

B) EXPECTED SKILLS

- Develop dynamic web applications using PHP.
- Apply OOP concepts in PHP.
- Handle forms, sessions, cookies, and files.
- Connect PHP with MySQL database and perform CRUD operations.

C) COURSE OUTCOMES (COs)

Students will be able to:

1. Understand PHP syntax, variables and control statements.
2. Use functions, arrays, and loops in PHP programs.
3. Apply OOP concepts in PHP.
4. Handle forms, sessions, cookies, and exceptions.

5. Perform file handling operations.
6. Develop database-driven applications using MySQLi and PDO.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**1.1** Introduction **1.2** Feature of PHP, Advantages, Purpose of using PHP for Web Development **1.3** PHP syntax, Data types: Scaler, Compound, Special Data Types, functions to check the type of variables. **1.4** Variables – declaration, naming convention rule - Variable scope -local and global. **1.5** PHP $ and $$ Variables **1.6** Constants- define(),const keyword. **1.7** Operators types - Arithmetic, Logical, Comparison, **1.8** Assignment, String, Increment/Decrement Operators **1.9** Comments- Single Line Comments, Multiple Line Comments. **1.10** Echo, Print, Difference between Echo and Print in PHP	TLO 1.1 Understand basic concepts of PHP, including its features, advantages, syntax, and data types. TLO 1.2 Declare and use variables and constants correctly by applying naming rules, scope concepts, and different operators. TLO 1.3 Write simple PHP programs using comments, echo/print statements, and different types of operators.	**5**	**10**	**CO1**
2	**2.1** Conditional Statements – if **s**tatement, If-else Statement, If-else-if Statement, nested if Statement. **2.2** Iterative statements - For Loop, While Loop, do-while loop, for each, Break, continue, switch. **2.3** Functions- categories of functions (Built-in and user-defined functions), advantages, syntax, parameterized function, Call by Value; Call By Reference, default arguments, variable arguments. **2.4** Arrays and function: Advantages, types - Indexed, Associative, Multidimensional. **2.5** String and string function–lower, upper, ucfirst,lcfirst, reverse, length.	**TLO 2.1** Apply conditional and iterative statements (if, switch, loops, break, continue) to control program flow in PHP. **TLO 2.2** Develop PHP programs using built-in and user-defined functions with different parameter passing methods. **TLO 2.3** Implement arrays and string functions to perform data manipulation in PHP programs.	**7**	**10**	**CO2**
3	**3.1** Object oriented programming, classes, objects, $this.	**TLO 3.1** Understand and implement object-oriented	**8**	**15**	**CO3**

	3.2 Constructor -__construct() Function ,Constructor with Parameters, Overloading the Constructor, Type Declaration in the Constructor and destructors. **3.3** Inheritance, types of inheritance - Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance. **3.4** Abstract classes, interface, difference between abstract and interface. **3.5** Polymorphism- Compile Time runtime : function overriding, abstract classes and interfaces. **3.6** Encapsulation , Access modifiers: public ,protected ,private. **3.7** Final keyword –classes, method and constant .	programming concepts including classes, objects, constructors, and destructors in PHP. **TLO 3.2** Apply inheritance, polymorphism, abstraction, and interfaces in PHP programs. **TLO 3.3** Demonstrate encapsulation using access modifiers and implement the final keyword in classes and methods.			
4	**4.1** Form handling –Get form, PostForm, include and require. **4.2** Session management –Cookies ,Working of PHP Cookies ,Setcookies function and delete cookies **4.3** Sessions, Working of PHP Sessions, session_start() function , Destroying Session **4.4** Exception Handling - try-catch ,Syntax ,try ,catch , throw, finally	**TLO 4.1** Develop PHP programs to handle web forms using GET and POST methods with include and require statements. **TLO 4.2** Implement session management using cookies and sessions in PHP. **TLO 4.3** Apply exception handling techniques using try, catch, throw, and finally blocks in PHP programs.	**8**	**15**	**CO4**
5	**5.1** File Handling –Open file, Open File Modes. **5.2** Read File - fread(), fgets() ,fgetc() ,Differences Between fread(), fgets(), and fgetc() **5.3** Write File -fwrite() ,file_put_contents() **5.4** Append to File –Syntax ,Parameters **5.5** Delete File -unlink() Function, Deleting Multiple Files	**TLO 5.1** Perform file operations such as opening and closing files using different file modes in PHP. **TLO 5.2** Implement file reading and writing operations using functions like fread(), fgets(), fgetc(), and fwrite(). **TLO 5.3** Apply file handling techniques to append and delete files using file_put_contents() and unlink() functions.	**6**	**10**	**CO5**
6	**6.1** Introduction to Database, connecting to database - mysqli_connect() PDO::__construct() Create Database- MySQLi CREATE DB – Creating a New Database **6.2** MySQLi CREATE TABLE – Defining Tables and Data Types	**TLO 6.1** Understand the basics of databases and establish a connection between PHP and MySQL using MySQLi and PDO. **TLO 6.2** Create and manage databases and tables using PHP with MySQL. **TLO 6.3** Perform CRUD	**6**	**10**	**CO6**

	6.3 MySQLi INSERT – Inserting Records into Tables **6.4** MySQLi UPDATE – Modifying Existing Records **6.5** MySQLi DELETE – Removing Records from Tables **6.6** MySQLi SELECT – Retrieving Data from TablesMySQLi ORDER BY – Sorting Query Results	operations (INSERT, UPDATE, DELETE, SELECT) and sort query results using ORDER BY in PHP applications.			

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK)

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	LLO1.1 Write PHP program for performing basic input and output operation in given problem statement.	1. Write PHP program to display welcome message on screen. 2. Write PHP program that declares variables of different data types (integer, float, string, boolean, array).	**02**	**CO1**
2.	LLO1.2Write PHP program to solve given expression.	Implement a PHP programs using following operators: 1. Arithmetic 2. Relational &logical 3. Assignment 4. Bitwise 5. Membership 6. Identity	**02**	**CO1**
3.	LLO 2.1 Write PHP program for solving given problem using various if statement	Implement a PHP program to Demonstrate the use of following conditional statements: 1. if statement 2. if..else statement 3. if...elseif...else statement 4. nested if statement 5.switch statement	**02**	**CO2**
4.	LLO 2.2 Write PHP program for solving given problems using various looping structure.	Implement a PHP program to Demonstrate the use of following looping statements: 1. while loop 2. for loop 3. nested loop 4.do-while loop	**02**	**CO2**
5.	LLO2.3 Write function to solve given problem.	Write a user define function to implement following features: 1. Function without arguments 2. Function with argument 3. Function returning value	**02**	**CO2**
6.	LLO2.4 Write PHP program to Create	Implement user-defined function for given	**02**	**CO2**

	function by selecting appropriate type of argument.	problem: 1. Function with default arguments. 2. Function with variable length argument.		
7.	LLO3.1 Write PHP program to to demonstrate Object-Oriented Programming concepts.	Write PHP programs to demonstrate following Object-Oriented Programming concepts: 1. Classes. 2.Objects. 3. Constructors 4.Destructors	**02**	**CO3**
8.	LLO3.2 Write PHP program to to demonstrate advanced Object-Oriented Programming concepts.	Write PHP program to demonstrate Advanced Object-Oriented Programming : 1. Inheritance. 2.Final Keyword 3. polymorphisms	**02**	**CO3**
9.	LLO4.1Write PHP program to demonstrate form handling concepts.	Implement concept of form handling using following methods: 1. GET 2. POST 3.include 4.require	**02**	**CO4**
10.	LLO 4.2 Implement PHP programs to demonstrate state management using cookies and sessions.	Write PHP programs to demonstrate following concept of state management: 1.Cookie 2.Session	**02**	**CO4**
11.	LLO 4.3 Implement exception handling in PHP using try, catch, throw, and finally statements.	Implement **exception handling** using try, catch, throw, and finally statements.	**02**	**CO4**
12.	LLO 5.1 Develop PHP programs to perform file operations such as open, read, and write.	Implement a PHP program to Demonstrate file handling mode: 1.open 2.read 3.write	**02**	**CO5**
13.	LLO 5.2 Implement PHP programs to append data to files and delete files.	Implement a PHP program to Demonstrate file handling mode: 1.append 2.delete	**02**	**CO5**
14.	LLO 6.1 Develop PHP programs to create databases and tables using MySQL.	Write PHP programs to demonstrate following concept of database connectivity : 1.Create database 2.create table	**02**	**CO6**
15.	**LLO 6.2** Implement PHP programs to perform database manipulation	Implement a PHP program to demonstrate following concept of database	**02**	**CO6**

	operations such as insert, update, and delete.	manipulation : 1. Insert 2.update 3.delete		
16.	LLO 6.3 Develop PHP programs to retrieve and sort data using select and order by clauses.	Write PHP programs to demonstrate following concept of database. 1.select 2.order by	**02**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Self-Learning

• Prepare a report on different server-side scripting languages (PHP, ASP.NET, JSP, Node.js).
• Study and document PHP framework basics (Laravel / CodeIgniter – overview only).
• Create simple dynamic web pages using PHP.

1. Design a registration form.
2. Validate form data using PHP.
3. Store form data in MySQL database.
4. Retrieve and display data from database.
5. Implement session management in the application.

• Implement file handling programs (read/write/append/delete).
• Complete any one course related to PHP or Web Development on Infosys Springboard platform.

Assignment

• Solve assignments covering all COs given by the teacher (PHP basics, OOP, form handling, file handling, database connectivity).

Micro Project

• Develop a **Student Registration System** using PHP and MySQL (store and display student details).
• Develop an **Online Food Ordering System** that stores menu details and generates bill.
• Develop a **Library Management System** using PHP and MySQL (maintain book records and issue details).
• Develop a **Simple Login and Authentication System** using sessions and cookies.

Note: Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

If a microproject is assigned, it is expected to be completed as a group activity.

SLA marks shall be awarded as per the continuous assessment record.

For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.

If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer System – Any computer system with basic configuration	All
2	PHP Development Environment (XAMPP/WAMP/LAMP with MySQL)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to PHP and Basic Concepts	5	4	3	3	10
2.	Control Structures, Functions, Arrays and Strings	7	3	4	3	10
3.	Object Oriented Programming in PHP	8	3	6	6	15
4.	Form Handling, Session Management and Exception Handling	8	3	6	6	15
5.	File Handling in PHP	6	3	4	3	10
6.	Database Connectivity using MySQL and PDO	6	2	4	4	10
	Total	**40**	**18**	**27**	**25**	**70**

I) ASSESMENT TOOL –

1) Formative assessment

1) Continuous assessment based on process and product related performance indicators
2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
3) A continuous assessment-based term work

2) Summative Assessment

1) Lab performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	Luke Welling & Laura Thomson	PHP and MySQL Web Development	Addison-Wesley, ISBN: 978-0672329166
2	Robin Nixon	Learning PHP, MySQL & JavaScript	O'Reilly Media, ISBN: 978-1491978917
3	Rasmus Lerdorf, Kevin Tatroe & Peter MacIntyre	Programming PHP	O'Reilly Media, ISBN: 978-1492054139

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1	https://www.php.net/ (Official PHP Manual)
2	https://www.w3schools.com/php/
3	https://www.tutorialspoint.com/php/index.htm
4	https://www.geeksforgeeks.org/php-tutorial/
5	https://www.mysqltutorial.org/
6	https://www.w3schools.com/mysql/

Note:
Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

Course Outcome	Course Outcome									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO2**	**PSO3**
CO1	3	2	2	1	-	-	-	-	2	1
CO2	3	2	3	2	-	-	-	-	3	1
CO3	3	3	3	2	-	-	-	-	2	1
CO4	3	3	3	2	-	-	1	-	3	2
CO5	3	3	3	2	-	1	1	-	3	2
CO6	3	3	2	2	1	1	2	-	2	3

Legends: - High: 03, Medium: 02, Low:01, No Mapping: -

Cusrow Wadia Institute of Technology, Pune-1

Diploma Programme	Computer Engineering
Course Name	Seminar and Project Initiation
Course code	R23CP1407
Course Category	AEC
Credits	1

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	2	1	3	1	-	-	-	-	-	25	10	25	10	25	10	75

A) RATIONALE

Most diploma graduates lack confidence and fluency when presenting papers or interacting in group situations. Seminar presentations help students build confidence and prepare them for interviews and group discussions. This course aims to improve students' skills in writing and presenting papers, while also encouraging them to think more broadly. Through the seminar course, students explore new ideas, technologies, and services related to their field of study. Furthermore, working on projects helps them plan effectively, set goals, and enhance their communication and interpersonal skills.

B) EXPECTED SKILLS

Students will develop presentation, communication, research, critical thinking, problem-solving, teamwork, analytical, time management, and professional and ethical skills.

C) COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve and demonstrate the following Course Outcomes (COs) upon completion of the course:

1. Select and analyze a suitable topic by collecting and organizing relevant data for a seminar.
2. Prepare and deliver an effective seminar presentation using appropriate communication and presentation tools.

3. Demonstrate critical thinking and engagement by encouraging discussion, interaction, and knowledge sharing during the seminar.

4. Identify a real-world problem and formulate a project plan including objectives, methodology, and expected outcomes for capstone implementation.

IV. General Guidelines for Seminar and Project Initiation

- The seminar must be related to emerging trends in the engineering/technology programme or may be inter/multi-disciplinary, based on industry expectations and programme outcomes.
- Individual students have different aptitudes and strengths. Therefore, the **seminar** should match the strengths of the students. For this purpose, students shall be asked to select the **title(theme)** of the seminar they would like to prepare and present.
- Seminar titles are to be finalized in consultation with the faculty mentor.
- The seminar must involve logical development and application of various technologies/processes applicable in the industry.
- The seminar must be assigned to an individual student. However, support from other students may be taken during presentation, if required.
- Students are required to prepare their seminar using relevant software tools and written content for presentation.
- Students shall submit **one hard copy and one soft copy** of the presentation and may be encouraged to keep a recorded copy of the seminar presentation.
- A batch of **3–4 students** shall be formed for project initiation.
- Projects provide a platform for students to demonstrate an attitude of inquiry and identify problem statements related to their programme.
- Students shall identify information suggesting the cause of the problem and possible solutions.
- Students shall study and assess the feasibility of different solutions along with financial implications.
- Students should collect relevant data from various sources such as books, the internet, market, suppliers, and experts (through surveys/interviews).
- Students shall prepare the required drawings/designs and a detailed plan for successful execution of the project.
- Students may visit relevant organizations related to the problem statement as part of the initial study.

V. Guidelines for Seminar Preparation and Presentation

Once the seminar title/topic is finalized and allotted, the teacher's role becomes important as a **guide, mentor, and motivator** to promote learning and sustain student interest.

The following should be kept in mind while preparing and presenting the seminar:

- **Seminar Orientation and Briefing:** Topics/themes should be innovative, novel, and relevant to the programme curriculum, and aligned with industry expectations.
- **Seminar Literature Survey (Information Search and Data Collection):** The information and data collected should be authentic, realistic, and relevant to the curriculum.

- **Seminar Preparation and Presentation:**
  The seminar should be presented using appropriate software tools with supporting handouts/notes. The duration of the presentation should not exceed **20 minutes**, including the Q&A session.

Guidelines for Project Initiation

- **Establishing Project Scope:** Define the boundaries of the project.
- **Defining Project Objectives:** Set clear and measurable objectives aligned with the project purpose.
- **Stakeholder Identification and Analysis:** Identify all stakeholders involved and analyze their needs and expectations.
- **Team Formation:** Build a team with the necessary skills and expertise to execute the project successfully.
- **Documentation:** Prepare a project plan including action plan, scope, objectives, and design. The document should be available to all stakeholders.

VI. Criteria of Assessment / Evaluation of Seminar

A. Formative Assessment (FA) Criteria:

The assessment of students in the fifth semester under Progressive Assessment (PA) for **25 marks** shall be carried out based on the following criteria:

- Suggestive **rubrics for assessment**

A. Suggestive RUBRICS for assessment

Sr. No.	Criteria	Marks
1	Topic Selection and Relevance	5
2	Literature Review and Data Presentation	5
3	Quality of Preparation and Innovativeness	5
4	Presentation Skills and Q&A Handling	5
5	Time Management and Seminar Report	5

Rubrics for assessment of Project Initiation

Sr. No.	Criteria	Marks
1.	Selection of Problem Statement/Theme	5
2.	Innovativeness of the Idea and Creativity	5
3.	Development Stages of Action Plan |	5
4.	Planning and Execution of Prototype / Model	5
5.	Prototyping and Implementation	5

The total marks as per above out of 50, shall be converted in proportion of 25 marks.

B. Summative Assessment criteria/

The summative assessment of the students in the fifth semester End-Semester Examination (ESE) for 25 marks shall be carried out based on the following criteria. This assessment shall be conducted by the faculty.

Suggestive **RUBRICS** may be developed by the faculty

Sr. No.	Criteria	Mark
1	Quality of information/Knowledge presented in SEMINAR	5
2	Creativity, Innovation in SEMINAR presentation	5
3	Response to the question during seminar presentation	5
4	Establishment of Innovative Problem Statement and its presentation	5
5	Objectives of the project and action plan	5

The total obtained marks shall be converted in proportion of 25 marks.

VII. Typographical Instructions / Guidelines for Seminar Preparation & Presentation

The seminar PPT shall be prepared (English – British).

- **Text Font:** Times New Roman (TNR), Size – 12 point
- **Subsection Heading:** TNR, 12 point, bold (normal case)
- **Section Heading:** TNR, 12 point, CAPITAL, bold
- **Chapter Name/Topic Name:** TNR, 14 point, CAPITAL
- **Alignment:** All text should be justified (apply settings in Paragraph)
- Different colors for text, diagrams, and tables may be used for better presentation
- The name of the candidate, diploma (department), year of submission, and name of the institute shall be printed on the **first slide of the PPT**.

VIII. Seminar and Project Initiation Report

On completion and presentation of the seminar, every student shall submit a **brief report** containing the following:

- Cover Page (as per Annexure 1)
- Title Page (as per Annexure 2)
- Certificate by the Guide (as per Annexure 3)
- Acknowledgment (the candidate may thank all those who helped in the execution of the project)
- Abstract of the paper presented in the seminar
  (It should be within one page and include the purpose of the seminar and methodology)
- Index
- List of Figures
- Introduction
- Literature Review
- Information/Chapters related to the seminar topic
- Advantages and Disadvantages
- Conclusion

Project Initiation

a) Description of problem statement

b) Scope and objectives

c) Stakeholders

d) Platform/Equipment/Resources identification

Bibliography / References

Note: The seminar report must contain only relevant details related to technology, platform, OS, or Tools used and should not exceed **25–30 pages**.

Details of Soft Copy to be Submitted

The soft copy of the seminar presentation is required to be provided on the back cover of the seminar report in a clear packet. It should include the following folders and contents:

1. **Presentation:**
   - Should include a PPT of the project
   - Maximum **15 slides**
2. **Documentation:**
   - Should include a Word file of the project report

Note: The soft copy must be checked for any harmful viruses before submission.

IX. Suggestive CO-PO-PSO Mapping

Course Outcomes (COs)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	1	–	–	1	–	–	1
CO-2	1	1	2	2	–	1	1	–	2	–
CO-3	1	2	1	1	1	2	1	–	1	–
CO-4	2	3	3	2	1	3	2	1	1	1

Legends: - High: 03, Medium: 02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	INTERNSHIP(12WEEKS)
Course code	R23CP5401
Course Category	INP
Credits	10

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
				36-40	10	-	-	-	-	-	100	40	100#	40	-	-	200

I. RATIONALE

Internships provide diploma students with practical exposure to industry environments and real-time problem solving. They help learners connect classroom knowledge with workplace applications, enhancing technical and professional competence. Students gain insights into organizational culture, teamwork, and safety practices. This experience prepares them for employability, higher education, and lifelong learning in the dynamic field of computer engineering.

II. EXPECTED SKILLS

Students will develop technical competence in troubleshooting, software applications, and networking through hands-on practice. They will also strengthen communication, teamwork, safety awareness, and documentation skills required in professional settings.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

When students finish this course they should be able to do the following things:

CO1: Demonstrate awareness of industrial safety, discipline, and resource management.

CO2: Apply computer engineering knowledge to solve practical industry problems.

CO3: Communicate effectively and work collaboratively in professional environments.

CO4: Prepare structured technical documentation and reflect on industrial experiences.

IV. General Guidelines for Organizing Industrial Training

The industry/organization selected for industrial training/internships shall be Government, Public Limited, Private Limited, Startup, Centre of Excellence, Skill Centers, Skill Parks, etc.

1. Duration of Training:

12 weeks (student engagement time)

2. Period / Time Slot:

Between 4th and 5th semester (12 weeks), i.e., internships will commence immediately after the 4th semester examinations.

3. Industry Area:

Engineering programme allied industries of large, medium, or small-scale organizations, including Government and Semi-Government sectors.

V. Roles of Department at the Institute

The following activities are expected to be performed by the concerned department at the polytechnic:

Table of Activities for Internship

S. No.	Activity	Suggested Schedule
1	Collection of information about industries available and ready to provide training (Sample Format 1)	1st to 3rd week of 4th semester
2	Allocation of students and mentors (Mentor: Student ratio 1:15)	4th to 6th week of 4th semester
3	Communication with industry and obtaining confirmation (Sample Letter Format)	6th to 8th week of 4th semester
4	Securing consent letter from parents/guardians (Sample Format 2)	Before 10th week of 4th semester
5	Enrollment of students for industrial training (Format 3)	Before 12th week of 4th semester
6	Issue of letter to industry with details of students and mentor (Format 4)	Before 14th week of 4th semester
7	Organize internship orientation session for students	Before end of 4th semester
8	Progressive assessment by mentor	Weekly during training
9	Final assessment by institutional and industry mentor	5th Semester ESE

VI. Suggestions

4The department can take help from alumni or parents of students having contacts in industries for securing placements.

5. Students should be placed based on their preferences. In case of high demand for a particular industry, allocation should be based on merit and potential. Preference may be given to students who arrange placements through personal contacts.

6. The Principal/HOD/Faculty should brief students on industrial safety norms, rules, and discipline before sending them for training.

7. Faculty members should monitor student progress through visits or online mode, including attendance, discipline, and report preparation on a weekly basis.

VII. Roles and Responsibilities of Students

8. Students may interact with mentors to suggest suitable industries. Contacts through parents/relatives may be utilized.

9. Students must submit duly signed forms along with the training letter to the industry mentor on the first day.

10. Students must carry their institute identity card during training.

11. Students must follow industrial dress code; otherwise, the college uniform is compulsory.

12. Students must obtain information about schedule, rules, and safety norms and strictly follow them.

13. Any violation of rules or discipline may lead to disciplinary action.

14. Students must maintain a weekly diary (Format 6) and get it signed by the mentor.

15. Any major issue (accident/disciplinary) must be reported immediately to the institute mentor.

16. Students must prepare and submit a final report signed by both industry and institute mentors.

17. Students must submit the undertaking (Format 5).

VIII. Typographical Guidelines for Industry Training Report

1. Report must be computer typed (English – British) on A4 paper
2. Font: Times New Roman (TNR), Size – 12 point
3. Subsection headings: TNR, 12 point, bold
4. Section headings: TNR, CAPITAL, bold
5. Chapter titles: TNR, 14 point, CAPITAL
6. Text should be justified
7. Margins: Left – 3.5 cm, Top – 2.5 cm, Right & Bottom – 1.25 cm
8. Report must be hardbound/spiral bound with black cover page (student name, department, year, institute name)
9. Order: Title Page → Certificate → Acknowledgment → Contents

IX. Suggestive Format of Industrial Training Report

- Title Page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapters of Industrial Training Report

Chapter 1: Organization Structure of Industry and General Layout

Chapter 2: Introduction to Industry/Organization

(History, type of products and services, turnover, number of employees, etc.)

Chapter 3: Types of Major Equipment/Raw Materials/Instruments/Machines/Hardware/Software Used in the industry with their specifications, approximate cost, specific use, and routine maintenance carried out

Chapter 4: Processes/Manufacturing

Manufacturing techniques and methodologies and material handling procedures

Chapter 5: Testing of Hardware/Software/Raw Materials/Major Material Handling Products *(Lifts, cranes, slings, pulleys, jacks, conveyor belts, etc.) and material handling procedures*
Chapter 6: Safety Procedures Followed and Safety Gears Used by Industry
Chapter 7: Particulars of Practical Experience in Industry/Organization *(Production/Assembly/Testing/Maintenance)*
Chapter 8: Detailed Report of Tasks Undertaken During Training
Chapter 9: Special/Challenging Experiences Encountered During Training *(Including students' liking and disliking of workplaces, if any)*
Chapter 10: Conclusion
Chapter 11: References/Sources of Information

X. Suggested Learning Strategies During Training at Industry

- Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover, etc.
- They should also refer to the handbook of major machines and operations, testing, quality control, and testing manuals.
- Students may also visit websites of other industries where similar products are being manufactured.

XI. Tentative Week-wise Schedule of Industry Training

Industrial training is a common course for all Diploma programmes. Therefore, the industry selection depends on the nature of the programme and its related industry. The training activities may vary according to the nature and size of the industry.

The following table shows the details of activities to be completed during industrial training:

Details of Activities to be Completed During Industry Training

Week	Activity
1	Introduction to industry and departments
2	Study of industry layout, specifications of machines, raw materials, and components available in the industry

Continuation of Activities During Industry Training

- Study of setup and manufacturing processes
- Execute the given project/work assigned to the students and study safety and maintenance procedures
- Validation from the industry mentor regarding the project/work allocated
- Report writing

XII. Formative Assessment of Training: Suggested Rubric

Note:
Marks should be allotted in proportion to the presentations and outcomes observed. Marks excluding the component of Week 11 are to be filled by the institute mentor.

Week No	Task to be assessed	Outcome Achievement- Poor	Outcome Achievement- Moderate	OutcomeAchievement-High		Week-wise total Marks
		Poor Marks	Average Marks	Good Marks	Excellent Marks	
1	Introduction of Industry	Minimal Knowledge of Departments, processes ,products and work culture of the company **(Marks–1)**	Moderate Knowledge of Departments, processes, products and work culture of the company **(Marks–2)**	Good Knowledge of Departments, processes, products and work culture of the company **(Marks–3/4)**	Extensive Knowledge of Departments, processes, products and work culture of the company **(Marks–5)**	
2	Presentation of Layout of Industry, Specifications of Machines, raw materials, Components available in the industry	Minimal w.r.t. tasks **(Marks–1)**	Moderate w.r.t. tasks **(Marks–2)**	Good w.r.t. tasks **(Marks–3/4)**	Extensive w.r.t. tasks **(Marks–5)**	
3	Participation in setup and manufacturing processes/platforms	Minimal Participation with poor understanding **(Marks–1-8)**	Moderate Participation with poor understanding **(Marks–9-12)**	Good Participation with poor understanding **(Marks–13-17)**	Extensive Participation with poor understanding **(Marks–18-20)**	
4to 10	Execution of given projector work to the students, Follow of safety and maintenance procedures	Minimal Participation with poor understanding **(Marks–1-8)**	Moderate Participation with lower level understanding **(Marks–9-12)**	Good Participation with Good understanding **(Marks–13-17)**	Extensive Participation with excellent understanding **(Marks–18-20)**	
11	Validation by industry mentor regarding project or work allocated	Minimal Participation with poor performance **(Marks–1-10)**	Moderate Participation with acceptable performance **(Marks–11-15)**	Good Participation with Good performance **(Marks–16-20)**	Extensive Participation with excellent performance **(Marks–21-25)**	

12	Diary writing	Results are not • Presented properly, Project work is • summarized and concluded not acceptable • Future Extensions are not specified **(Marks–1-10)**	• Results are Presented just casually Project • work is summarized and concluded casually • Future Extensions are casually specified **(Marks–11-15)**	• Results are Presented well and • properly, Project work is summarized and concluded to a Good level • Future extensions are well specified **(Marks–16-20)**	• Results are Presented exhaustively • Project work is summarized and elaborated in excellent manner ,concluded • Future Extensions are excellently specified **(Marks–21-25)**	
	Total Out of:100					

Marks for (FA) are to be awarded for each week considering the level of completeness of activities observed as per the table specified in Sr. No. XIII above, based on the daily diary maintained. Feedback from the industry supervisor shall also be considered.

XIV Summative Assessment(SA)of training:

Academic year: 20-20

i)Suggested RUBRIC for SA

	Observations from Orals				**Presentations**				**Total (100)**
Enrollment Number	Tasks undertaken (20)	Overall Understanding (20)	Creativity /Innovation demonstrated (10)	Knowledge acquired (10)	Speech Clarity (10)	Body Language (10)	Presentations (10)	Diary ,Report writing and / Product (10)	

CO-PO-PSO Matrix

COs	PO1 Basic Knowledge	PO2 Problem Analysis	PO3 Design/Development	PO4 Tools & Testing	PO5 Society & Ethics	PO6 Project Mgmt	PO7 Lifelong Learning	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	2	2	1	1
CO2	3	3	2	3	2	2	2	3	2	2
CO3	2	2	2	1	2	3	2	1	2	2
CO4	2	2	2	2	2	3	3	2	2	3

Legends :- High:03, Medium:02,Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Recent Trends in Computer Networks
Course code	R23CP3401
Course Category	DSE
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations:
CL-Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA - Summative Assessment, IKS - Indian Knowledge System, SLA -Self Learning Assessment

A) RATIONALE

The Recent Trends in Computer Networks course covers Internet architecture, IP addressing, routing protocols (RIP, OSPF, BGP), TCP/UDP, DNS, SDN, 5G/6G, network management, monitoring, and security. It focuses on understanding modern network concepts, management frameworks, performance parameters, and emerging security trends like Zero Trust and AI-based anomaly detection.

B) EXPECTED SKILL/s –

The expected skill set of this course is to enable students to attain the following Industry Identified Outcome through various teaching-learning experiences: apply networking concepts and modern technologies to design, manage, and secure computer networks in real-world scenarios.

C) COURSE OUTCOMES (COs)

The students will able to-

1. Apply subnetting, address masking techniques, ARP/RARP mechanisms.

2. Analyze routing protocols and interpret router architecture and routing tables.

3. Explain the role and purpose of transport protocols (UDP, TCP, SCTP) in Internet applications.

4. Elaborate the role of wireless network technologies and modern networking trends.

5. Interpret network management frameworks, performance parameters, and evaluation tools.

6. Identify various types of network attacks and vulnerabilities in modern systems.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX	CO Mapped
1	**Internet Architecture and Network Layer** **1.1** Structure of Internet, Intranet, Role of Internet Service Provider (ISP)and Internet corporation for Assigned names and numbers(ICANN) **1.2** IPv4-Header format, IPv6-Header format, **1.3** Subnet, subnet addressing and address masking, Supernetting **1.4** Address Mapping-Address Resolution Protocol(ARP)- Mapping logical to physical addresses, working and message format Reverse Address Resolution Protocol (RARP)- Mapping physical to logical addresses, working and message format	**TLO 1.1:** Identify the role of ISP and ICANN. **TLO 1.2:** Compare IPv4 and IPv6. **TLO 1.3:** Configure subnets in a network. **TLO 1.4:** Interpret the role of ARP and RARP.	6	**10**	**CO1**
2	**Routing Protocols** **2.1** Router Architecture, Routing table, queueing and switching **2.2 Routing protocols**- Intra domain routing- Distance vector routing-Creating distance vector , routing tables, Initialization sharing, Updating-Routing Information Protocol(RIP Link State Routing- Open Shortest Path First(OSPF)- Types of links, Graphical representation, Inter domain Routing – Path Vector Routing –Border Gateway Protocol(BGPv4)	**TLO 2.1:** Describe router architecture, routing tables, queuing, and switching operations. **TLO 2.2:** a) Explain intra domain routing using Distance Vector and Link State protocols. **b)** Compare RIPv2 and OSPF in terms of operation and network suitability. **c)** Interpret inter domain routing and the role of BGPv4 in connecting autonomous systems.	8	**15**	**CO2**
3	**Transport Layer Protocols** **3.1 Process to Process Delivery-** Client/Server paradigm, Multiplexing and	**TLO 3.1:** Explain process-to-process delivery, client/server paradigm, multiplexing,	6	**10**	**CO3**

	demultiplexing, Connectionless vs Connection Oriented-Service **3.2 User Datagram Protocol (UDP)**-Ports-Well known ports for UDP header format, Features and Applications **3.3 Transmission Control Protocol (TCP)**-TCP Services, TCP Features, Segment, Three way Handshaking, Flow control, Error Control, Congestion control-Open loop,Closed loop **3.4 SCTP(Stream Control Transmission Protocol)-**Services and Features	demultiplexing, and connectionless vs. connection-oriented services. **TLO 3.2:** Describe UDP, its ports, header format, features, and applications. **TLO 3.3:** Explain TCP services, features, segment structure, three-way handshaking, flow control, error control, and congestion control. **TLO 3.4:** Describe SCTP, its services, and key features.			
4	**Wireless Network Technologies** **4.1 Wireless Network Communication-**3G, 4G, 5G **4.2 Software Defined Network (SDN)-**Architecture, Working, Applications **4.3 Network Functions Virtualization (NFV)-**Architecture, Benefits, Applications **4.4 Edge Computing and Edge Networking-**Definition, Components, Challenges, Applications **4.5 Multimedia Wireless Networks –** Streaming Audio and Video, Voice Over Internet Protocol (VoIP), Protocols – Real-Time Transport Protocol (RTP), Real-Time Streaming Protocol (RTSP).	**TLO 4.1:** Explain and compare network performance metrics like throughput, latency, jitter, packet loss, and availability. **TLO 4.2:** Compare 3G, 4G, and 5G technologies in terms of architecture, data rate, and applications. **TLO 4.3:** Describe the architecture and benefits of Software Defined Networking (SDN). **TLO 4.4:** Explain the architecture and applications of Network Functions Virtualization (NFV). **TLO 4.5:** Describe Edge Computing and Edge Networking, their components, and real-world uses. **TLO 4.6:** Explain Multimedia Wireless Networks, focusing on streaming, VoIP, RTP, and RTSP protocols.	8	**15**	**CO4**
5	**Network Management and Monitoring** **5.1 Network Management-** Scope, role, importance in modern communication systems, function types. **5.2 Network Management Framework and Protocols** Elements- managing server, managed device, data, agent, protocol, SNMP CMIP **5.3 Network Monitoring** Importance, difference between	**TLO 5.1:** Explain the role and importance of network management. **TLO 5.2:** Describe network management functions and their applications. **TLO 5.3:** Explain network management frameworks and elements. **TLO 5.4:** Describe and compare SNMP and CMIP protocols. **TLO 5.5:** Differentiate network management and monitoring with	6	**10**	**CO5**

	management and monitoring, network performance parameters – Throughput or Bandwidth, Latency or Delay, Jitter, Packet Loss or Reliability, Availability or Uptime **5.4 Network Monitoring Methods and Tools** Active, passive, hybrid monitoring. Tools – Open source, commercial, visualization and reporting, features and benefits.	key performance metrics. **TLO 5.6:** Explain monitoring methods and tools (open-source and commercial).			
6	**Network Security Threats and Emerging Trends** **6.1 Evolution and Security Fundamentals** - Evolution of network systems from traditional to modern architectures, new challenges. **Core Security Principles**: Authentication, Authorization, Confidentiality, Integrity, Availability, and Non-repudiation (CIA triad + accountability). **6.2 Network Attacks and threats –** Passive Attacks, Active Attacks, Security threats **6.3 Network Security Protocols –** Secure Socket Layer (SSL) and Transport Layer Security (TLS), IP Security (IPsec), Secure Shell (SSH) , HTTPS and VPN technologies, WPA3 in wireless networks **6.4 Emerging Security Trends –** Zero Trust Architecture (ZTA), Network Access Control (NAC), Blockchain-based security, Quantum cryptography and post-quantum security, SDN and NFV, AI and Machine Learning for anomaly detection.	**TLO 6.1:** Explain the evolution of networks and emerging security challenges. **TLO 6.2:** Describe core security principles (CIA triad and accountability). **TLO 6.3:** Classify network attacks and security threats. **TLO 6.4:** Explain major network security protocols and technologies. **TLO 6.5:** Describe emerging security trends such as Zero Trust, NAC, and blockchain. **TLO 6.6:** Explain advanced security concepts including quantum security and AI/ML-based protection.	6	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr.No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial /Laboratory Learning Outcome (LLO)	Number of hrs.	Relevant COs
1	*a)Identify IP allocations and Internet Service Providers for a student network	**LLO 1.1:** Describe each component of the output of the WHOIS command.	2	CO1

	Using WHOIS. b)Set up IP addresses and subnet masks on given network devices	**LLO 1.2:** Configure a network by assigning IP addresses and subnet masks.		
2	*Identify and analyze network behaviour using diagnostic commands: show, debug, ping, tracert, and nslookup.	**LLO 2.1:** Use diagnostic tools such as ping, tracert, show, and debug to identify network faults. **LLO 2.2:** Analyze results to isolate and resolve network communication problems.	2	CO2
3	*Identify and resolve network issues using host-level commands: ipconfig, ipconfig /all, route print, netstat, and getmac.	**LLO 3.1:** Configure and verify routing protocols (RIPv2, OSPF) on routers using simulation tools. **LLO 3.2:** Analyze routing tables and verify data transmission between networks.	2	CO2
4	*Run a network communication script on Kali Linux.	**LLO 4.1:** Write and execute a program to simulate OSPF route calculation. **LLO 4.2:** Interpret OSPF link-state advertisements and path selection results.	2	CO2
5	*Implementation of a routing protocol using a Network Simulator.	**LLO 5.1:** Execute basic network communication scripts using Kali Linux tools. **LLO 5.2:** Analyze the results of communication or scanning scripts to understand network behavior.	2	CO2
6	*Implementation of OSPF protocol using any programming language.	**LLO 6.1:** Implement the core logic of the OSPF routing protocol using a suitable programming language. **LLO 6.2:** Simulate OSPF link-state advertisements and shortest path calculation. **LLO 6.3:** Verify correct route selection based on OSPF cost metrics.	2	CO2

7	*Analysis of Network Performance Parameters Using a Network Simulator and Wireshark.	**LLO 7.1:** Measure network performance parameters such as throughput, delay, jitter, and packet loss using a network simulator. **LLO 7.2:** Capture and analyze traffic using Wireshark to validate simulation results. **LLO 7.3:** Interpret captured data to evaluate network efficiency and congestion.	2	CO3
8	*Configure, diagnose, and troubleshoot TCP and UDP connection issues using diagnostic tools like netstat, Wireshark, and iperf.	**LLO 8.1:** Configure TCP and UDP connections on networked hosts. **LLO 8.2:** Use diagnostic tools such as netstat, Wireshark, and iperf to analyze connection behavior. **LLO 8.3:** Identify and troubleshoot common TCP and UDP performance issues.	2	CO3
9	*Design a simple network for Software Defined Networking (SDN) using Mininet.	**LLO 9.1:** Design and deploy a basic Software Defined Networking (SDN) topology using Mininet. **LLO 9.2:** Configure hosts, switches, and controllers within the SDN environment. **LLO 9.3:** Verify network connectivity and traffic flow in the SDN topology.	2	CO4
10	*Monitor network traffic using open-source tools such as Grafana and Wireshark.	**LLO 10.1:** Monitor real-time and historical network traffic using open-source tools. **LLO 10.2:** Visualize network performance metrics using Grafana dashboards. **LLO 10.3:**Analyze packet-level data using Wireshark to correlate traffic patterns.	2	CO5
11	*Using Ping and Latency Analysis Tools to Measure Latency and Packet Loss (e.g., PingPlotter).	**LLO 11.1:** Measure network latency and packet loss using ping-based tools. **LLO 11.2:**Analyze round-trip time variations and packet loss trends. **LLO 11.3:** Evaluate network stability based on latency analysis results.	2	CO5
12	*Analyze network packets to detect performance bottlenecks using suitable tools such as Wireshark or Grafana.	**LLO 12.1:** Capture network packets using suitable packet analysis tools. **LLO 12.2:**Analyze packet flows to identify performance bottlenecks. **LLO 12.3:** Interpret protocol behavior to diagnose congestion or delays.	2	CO5
13	*Multimedia Traffic Analysis – Capture and Analyze HTTP Video Streaming Traffic using a Suitable Tool (e.g., Wireshark).	**LLO 13.1:** Capture HTTP video streaming traffic using packet analysis tools. **LLO 13.2:** Identify streaming-related	2	CO5

		protocols and data flows. **LLO 13.3:**Analyze buffering, throughput, and quality-of-service parameters.		
14	*Monitor RTP (Real-time Transport Protocol) Packets from a Multimedia Stream using a Suitable Tool (e.g., Wireshark).	**LLO 14.1:** Capture RTP packets from a multimedia stream. **LLO 14.2:**Analyze RTP parameters such as sequence numbers, timestamps, and packet loss. **LLO 14.3:** Evaluate real-time communication performance based on RTP analysis.	2	CO5
15	To capture and analyze network traffic using Wireshark to understand passive information-gathering attacks such as sniffing.	**LLO 15.1:** Capture network packets using Wireshark. **LLO 15.2:** Analyze captured traffic to identify protocols and data flow. **LLO 15.3:** Interpret packet data to understand passive information-gathering attacks such as sniffing.	2	CO5
16	*To demonstrate file integrity verification using MD5 and SHA-256 hashes and to understand collision resistance and practical uses.	**LLO 16.1:** Generate hash values using MD5 and SHA-256 algorithms. **LLO 16.2:** Compare hash outputs to verify file integrity. **LLO 16.3:** Analyze the concepts of collision resistance and practical applications of hashing	2	CO6
17	To configure a web server to serve content over HTTPS using a self-signed certificate and to verify TLS handshake and certificate properties.	**LLO 17.1:** Configure a web server to enable HTTPS using a self-signed certificate. **LLO 17.2:** Observe and analyze the TLS handshake process. **LLO 17.3:** Verify certificate properties and evaluate secure communication setup.	2	CO6

Note: Out of above suggestive LLOs-

- '*'Marked Practicals (LLOs) are mandatory.
- Minimum 80% of above list of lab experiments are to be performed.
- Judicialmix of LLOs is to be performed to achieve desired outcomes.

F) SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/ SKILLS DEVELOPMENT(SELFLEARNING)

Assignment

- Case studies on relevant topics.

G) LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

Sr.No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Wireshark or any other similar software to capture and investigate packets	7,8,10,12,13,14,15,17
2	Cisco Packet Tracer, MiniNet or any other similar software	1,2,5,6,9
3	Computer system (Any computer system with basic configuration, connected to LAN)	1,3,4,8,11,16

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESMENT PURPOSE (Specification Table)

Sr. No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	**Internet Architecture and Network Layer**	1	6	4	6	0	10
2	II	**Routing Protocols**	2	8	4	6	2	15
3	III	**Transport Layer Protocols**	3	6	4	7	2	10
4	IV	**Wireless Network Technologies**	4	8	5	8	2	15
5	V	**Network Management and Monitoring**	5	6	4	4	2	10
6	VI	**Network Security Threats and Emerging Trends in the**	6	6	4	4	2	10
Grand Total				**40**	**25**	**35**	**10**	**70**

I) SUGGESTEDLEARNINGMATERIALS/BOOKS

Sr. No.	Title of Book	Author	Publication (with year)
1	Computer Networking: A Top-Down Approach	James F. Kurose & Keith W. Ross	Pearson Education — various editions; latest (9th edition)
2	Data Communication and Networks	Dr. Brahampal Singh	BPB Publications, **2024**

3	Data Communications and Networking	Behrouz A. Forouzan	McGraw Hill Education, *5th Edition* (also available in later *6th Edition* under the title *Data Communications and Networking with TCP/IP Protocol Suite*)
4	Computer Networks, Sixth Edition	Tanenbaum Andrew S. ,NickFeamster,David J. Wetherall	Pearson ISBN-13: 9780136764052
5	Data And Computer Communications	William Stallings	ISBN: 0-13-243310-9 8TH Edition
6	Network Security Essentials	William Stallings	ISBN 10: 0-13-610805-9 ISBN 13: 978-0-13-610805-4
7	Network Functions Virtualization (NFV) with a Touch of SDN	Rajendra Chayapathi Syed Farrukh HassanParesh Shah	Pearson Education ISBN-13: 978-0-13-446305-6 ISBN-10: 0-13-446305-6

J) WEBSITES LINKS

Sr. No	Link/Portal	Description
1	https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/	Comprehensive Computer Networks tutorial covering network fundamentals, models (OSI/TCP-IP), IP addressing, subnetting, routing protocols (RIP, OSPF, BGP), TCP/UDP, network performance, security, and more.
2	https://www.tutorialspoint.com/software-defined-networking/index.htm?utm_source=chatgpt.com	Tutorial on **Software Defined Networking (SDN)** covering architecture, benefits, challenges of network virtualization, controller/data plane separation, and use cases.
3	https://en.wikipedia.org/wiki/5G?utm_source=chatgpt.com	Wikipedia page explaining **5G** wireless technology, its feature of cellular networks.
4	https://tkiet.digimat.in/nptel/courses/video/106105183/L02.html	This lecture describes the evolution of data communication networks from traditional telephone systems to modern Internet-based architectures.

K) SUGGESTED COS – POS MATRIX FORM

Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design / Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO1	PSO2	PSO3
CO1	2	-	1	1	1	-	1	1	-	-
CO2	3	2	1	1	-	-	1	-	-	-
CO3	3	1		1	-	-	-	-	-	-
CO4	2	1	2	2	1	-	-	-	-	-
CO5	3	2	2	2	1	-	1	1	-	-
CO6	2	2	2	2	2	-	1	1	-	-

Legends:-High:03,Medium:02,Low:01,NoMapping:-

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	**Computer Engineering**
Course Name	Database Architecture and Emerging Technologies(DA&ET)
Course code	**R23CP3402**
Course Category	DSE
Credits	**4**

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					**Credits**	**Assessment Scheme**											
Contact Hrs./Week			**Self-Learning (Term Work + Assignment)**	**Notional Learning Hrs / Week**		**Paper Duration (hrs.)**	**Theory**				**Practical (Based on LL & TL)**				**Based on Self Learning**		**Total Marks**
							FA-TH	**SA-TH**	**Total**		**FA-PR**		**SA-PR**		**SLA**		
CL	**TL**	**LL**					**Max**	**Max**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	
4	-	2	-	6	4	3	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations:

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

Database Architecture and Emerging Technologies focus on modern database technologies used in enterprise, cloud, distributed, and big data environments. The course covers database architecture, distributed databases, object-oriented databases, NoSQL databases, data warehousing, cloud databases, and emerging database technologies. The knowledge gained will help students design scalable, secure, and high-performance database solutions for modern applications.

B) EXPECTED SKILL/s –

To design and manage advanced database solutions using distributed databases, NoSQL databases, data warehouses, and cloud database platforms for modern applications.

C) COURSE OUTCOMES (COs) –

Students will be able to

1. Analyze advanced database architectures and optimization techniques.
2. Apply concepts of parallel and distributed database systems.
3. Design and use object-oriented and XML databases.
4. Implement NoSQL databases and MongoDB applications.
5. Design data warehouse solutions and apply data mining techniques.
6. Evaluate cloud database platforms and emerging database technologies.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1.	**Database System Architecture and Query Optimization** **1.1 Database Architecture-** Centralized Database Systems ,Client-Server Architecture **,**Two-Tier and Three-Tier Architecture Transaction Server and ,Data Server **1.2 Concurrency Control Techniques-** Lock-Based Protocols ,Two-Phase Locking Protocol (2PL) ,Timestamp-Based Protocols , Multiversion Concurrency Control (MVCC) **1.3 Query Processing-** Query Parsing ,Query Evaluation ,Query Execution Plans **1.4 Query Optimization-** Cost-Based Optimization ,Heuristic Optimization ,Join Optimization **1.5 Database Performance Tuning-** Performance Metrics ,Query Tuning ,Resource Monitoring , Bottleneck Analysis	**TLO 1.1**Explain various database architectures and their functionalities. **TLO 1.2**Describe concurrency control techniques used in database systems. **TLO 1.3**Explain the process of query processing and execution. **TLO 1.4**Apply query optimization techniques for improving database performance. **TLO 1.5**Analyze database performance and tuning methods.	**7**	**15**	**CO1**
2.	**Parallel and Distributed Database Systems** **2.1 Introduction to Parallel Databases-** Need for Parallel Databases ,Parallel Database Architectures ,Shared Memory Architecture ,Shared Disk Architecture Shared Nothing Architecture **2.2 Performance Measures** Throughput ,Response Time	**TLO 2.1:** Explain the need and architecture of parallel database systems. **TLO 2.2:** Compare various parallel database architectures and performance measures. **TLO 2.3:** Explain data distribution techniques used in distributed database systems. **TLO 2.4:** Explain distributed transaction processing using Two-Phase Commit and Three-	**8**	**10**	**CO2**

	Scale-Up ,Speed-Up **2.3 Data Distribution Techniques** Fragmentation **,**Replication **,**Allocation Strategies **2.4 Distributed Transaction Processing** Two-Phase Commit Protocol , Three-Phase Commit Protocol, Distributed Deadlock Handling	Phase Commit protocols. **TLO 2.5:** Explain distributed deadlock handling mechanisms in distributed database systems.			
3.	**Object-Oriented Databases and XML** **3.1 Object-Oriented Database Concepts-** Objects and Classes ,Encapsulation ,Inheritance ,Polymorphism **3.2 Object-Relational Databases-** Complex Data Types **,,**Structured Types ,User Defined Types (UDTs) **3.3 Collection Types-** Nested Tables ,Arrays ,Multisets **3.4 XML Fundamentals** XML Structure ,XML Schema ,DTD (Document Type Definition) **3.5 XML Query Languages** XPath ,XQuery ,FLWOR Expressions ,XML Data Storage and Retrieval	**TLO 3.1**Explain the concepts of object-oriented databases. **TLO 3.2**Apply object-relational database concepts using structured and user-defined types. **TLO 3.3**Use collection types such as arrays, nested tables, and multisets. **TLO 3.4**Describe XML structure and XML schema. **TLO 3.5**Write XML queries using XPath and XQuery.	**6**	**10**	**CO3**
4.	**NoSQL Databases and MongoDB** **4.1 Introduction to NoSQL** Structured, Semi-Structured and Unstructured Data ,CAP Theorem ,BASE Properties **4.2 Types of NoSQL Databases** Key-Value Databases ,Document Databases ,Column Family Databases ,Graph Databases **4.3 MongoDB Fundamentals** MongoDB Architecture ,Collections and Documents ,BSON Format **4.4 MongoDB Operations**	**TLO 4.1**Differentiate between structured, semi-structured, and unstructured data. **TLO 4.2**Explain the concepts and types of NoSQL databases. **TLO 4.3**Perform CRUD operations using MongoDB. **TLO 4.4**Write MongoDB queries using operators and aggregation functions. **TLO 4.5**Explain advanced	**7**	**15**	**CO4**

	CRUD Operations ,QueryOperators ,Aggregation Framework ,Indexing **4.5 Advanced MongoDB Features** Replication ,Sharding ,MongoDB Atlas ,Performance Optimization	MongoDB features such as replication and sharding.			
5.	**Data Warehousing and Data Mining** **5.1 Data Warehouse Architecture-**Components of Data Warehouse **,**Virtual Warehouse Metadata, Repository **5.2 ETL Process** Extraction ,Transformation ,Loading **5.3 Dimensional Modeling** Fact Tables **,**Dimension Tables **,**StarSchema **,**Snowflake Schema **5.4 Data Mining Techniques** Classification ,Decision Trees Regression ,Clustering ,Association Rule Mining **5.5 Data Lake and Data Lakehouse** Data Lake Concepts ,Data Lakehouse Architecture ,Applications and Benefits	**TLO 5.1**Describe the architecture and components of a data warehouse. **TLO 5.2**Explain the ETL process used in data warehousing. **TLO 5.3**Design dimensional models using fact and dimension tables. **TLO 5.4**Apply data mining techniques for data analysis. **TLO 5.5**Explain the concepts of Data Lake and Data Lakehouse.	**6**	**10**	**CO5**
6.	**Cloud Databases and Emerging Database Technologies** **6.1 Cloud Database Concepts-** Database as a Service (DBaaS) ,Cloud Database Deployment Models ,Scalability and Elasticity **6.2 Cloud Database Platforms** Oracle Cloud Database ,AmazonRDS ,Microsoft Azure SQL Database ,Google Cloud SQL **6.3 Database Security** Authentication and Authorization ,Role-Based Access Control (RBAC),Database Auditing **6.4 Big Data Database Technologies-** Hadoop Ecosystem ,HDFS ,ApacheSpark ,Real-Time Data Processing	**TLO 6.1**Explain cloud database concepts and deployment models**.** **TLO 6.2** Describe cloud database platforms and their features. **TLO 6.3**Explain database security mechanisms and access control techniques. **TLO 6.4**Describe Big Data technologies and their applications. **TLO 6.5**Explain emerging database technologies such as NewSQL, Graph Databases, Vector Databases, and AI-powered databases.	**6**	**10**	**CO6**

	6.5 Emerging Database Technologies NewSQL Databases ,GraphDatabases ,VectorDatabases ,AI-Powered Databases ,Blockchain Databases				

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr.No	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Title	No. of Hrs.	Relevant COs
1.	**LLO 1.1** Understand database architectures and server-based database systems.	Install suitable DBMS software and configure client-server database architecture. Study two-tier and three-tier database architecture.	**2**	**CO1**
2.	**LLO 2.1**Analyze concurrency control mechanisms.	Implement lock-based protocols and demonstrate Two-Phase Locking (2PL) using sample transactions.	**2**	**CO1**
3.	**LLO 3.1** Study parallel database architectures.	Comparative study of Shared Memory, Shared Disk and Shared Nothing architectures using case studies.	**2**	**CO2**
4.	**LLO 4.1**Analyze distributed database techniques.	Demonstrate data fragmentation, replication and allocation strategies in a distributed database environment.	**2**	**CO2**
5.	**LLO 5.1** Understand distributed transaction processing.	Study Two-Phase Commit (2PC), Three-Phase Commit (3PC) and distributed deadlock handling using simulation tools.	**2**	**CO2**
6.	**LLO 6.1** Create object-relational database structures.	Implement User Defined Types (UDTs), Structured Types and Table Inheritance concepts.	**2**	**CO3**
7.	**LLO 7.1** Implement collection data types in SQL.	Create and use Nested Tables, Arrays and Multisets in object-relational databases.	**2**	**CO3**

8.	**LLO 8.1** Create and manage XML databases.	Create XML documents, XML Schema and validate XML data using DTD/XSD.	**2**	**CO3**
9.	**LLO 9.1** Implement XML query operations.	Execute XPath and XQuery programs using FLWOR expressions, joins and nested queries.	**2**	**CO3**
10.	**LLO 10.1** Develop NoSQL databases using MongoDB.	Create MongoDB databases, collections and perform CRUD operations.	**2**	**CO4**
11.	**LLO 11.1** Implement advanced MongoDB queries.	Execute MongoDB queries using find(), projection operators and query filters.	**2**	**CO4**
12.	**LLO 12.1** Perform aggregation and indexing in MongoDB.	Implement Aggregation Framework, indexing and analyze query performance.	**2**	**CO4**
13.	**LLO 13.1** Study MongoDB replication and sharding.	Configure replication and sharding concepts using MongoDB Atlas or local setup.	**2**	**CO4**
14.	**LLO 14.1** Perform ETL operations in data warehousing.	Extract, Transform and Load (ETL) data from source to target warehouse.	**2**	**CO5**
15.	**LLO 15.1** Design dimensional models.	Create Fact Tables, Dimension Tables, Star Schema and Snowflake Schema for a business application.	**2**	**CO5**
16.	**LLO 16.1**Analyze OLAP operations.	Perform OLAP operations such as Roll-up, Drill-down, Slice and Dice on sample datasets.	**2**	**CO5**
17.	**LLO 17.1** Apply data mining techniques.	Implement Classification, Clustering and Association Rule Mining using suitable tools.	**2**	**CO5**
18.	**LLO 18.1** Explore cloud database platforms.	Create and manage databases using Oracle Cloud Database, Amazon RDS, Azure SQL Database or Google Cloud SQL.	**2**	**CO6**
19.	**LLO 19.1** Implement database	Configure Authentication,	**2**	**CO6**

	security mechanisms.	Authorization, RBAC and Database Auditing.		
20.	**LLO 20.1** Study Big Data and emerging database technologies.	Demonstrate Hadoop/HDFS, Apache Spark, Graph Databases, Vector Databases and AI-powered databases through case studies.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Assignment

- Solve assignment covering all COs given by teacher

Micro Projects

- Develop and maintain an XML database for a **Student Information Management System** using XML, XML Schema, XPath, and XQuery.
- Develop a **MongoDB database application** for an **Online Shopping System** to manage products, customers, orders, and inventory.

Note:

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer system - (Any computer system with basic configuration)	All
2.	Any RDBMS software (MySQL/Oracle/SQL server/ or any other)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	**Database System Architecture and Query Optimization**	**7**	**3**	**4**	**3**	**10**

2.	**Parallel and Distributed Database Systems**	**8**	**3**	**3**	**6**	**10**
3.	**Object-Oriented Databases and XML**	**6**	**3**	**4**	**6**	**15**
4.	**NoSQL Databases and MongoDB**	**7**	**3**	**4**	**6**	**15**
5.	**Data Warehousing and Data Mining**	**7**	**3**	**4**	**6**	**10**
6.	**Cloud Databases and Emerging Database Technologies**	**5**	**3**	**3**	**3**	**10**
	TOTAL	**40**	**18**	**22**	**30**	**70**

I) ASSESMENT TOOL –

4) Formative assessment

1) Continuous assessment based on process and product related performance indicators
2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
3) A continuous assessment-based term work

5) Summative Assessment

2) Lab performance, Viva voce.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Database System Concepts	McGraw Hill Education, 7th Edition, ISBN: 978-9354607484
2	Chakrabarti, Dasgupta, Shinde, KLSI	Advanced Database Management System	Dreamtech Press, ISBN: 9789351194552
3	Ivan Bayross	SQL, PL/SQL: The Programming Language of Oracle	BPB Publications, ISBN: 9788176569644
4	Jiawei Han, Micheline Kamber, Jian Pei	Data Mining: Concepts and Techniques	Morgan Kaufmann, 3rd Edition, ISBN: 9780123814791
5	Pramod J. Sadalage, Martin Fowler	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Addison-Wesley, ISBN: 9780321826626

6	Tom White	Hadoop: The Definitive Guide	O'Reilly Media, ISBN: 9781491901632
7	Kristina Chodorow	MongoDB: The Definitive Guide	O'Reilly Media, ISBN: 9781491954461

- **WEBSITES LINKS**

Sr. No.	Link / Portal	Description
1	MongoDB Documentation	MongoDB installation, CRUD operations, aggregation and administration
2	Oracle Database Documentation	Oracle Database concepts, architecture and administration
3	PostgreSQL Documentation	PostgreSQL installation, SQL and advanced database features
4	W3Schools XML Tutorial	XML, XPath and XQuery tutorials
5	JavaTpoint XML Database Tutorial	XML Database concepts and examples
6	JavaTpoint Data Warehouse Tutorial	Data Warehouse and Data Mining concepts
7	Apache Hadoop Documentation	Hadoop ecosystem and HDFS
8	Apache Spark Documentation	Spark architecture and real-time data processing
9	Microsoft Learn - Azure SQL Database	Azure SQL Database tutorials and learning resources
10	AWS Amazon RDS Documentation	Amazon RDS setup and management
11	Google Cloud SQL Documentation	Google Cloud SQL deployment and administration
12	Neo4j Graph Database Documentation	Graph Database concepts and implementation

K) CO-PO-PSO Matrix –

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	1	1	1	-	2	-	1	-
CO2	2	2	2	1	1	-	2	-	1	-
CO3	2	2	2	2	-	-	2	-	1	-
CO4	2	2	2	2	-	-		-	1	-
CO5	2	2	1	1	1	-	-	-	1	-
CO6	2	2	1	-	-	-	1	-	1	2
Legends: - High:03, Medium:02, Low:01, No Mapping: -										

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Fundamentals of Data Science
Course Code	R23CP3403
Course Category	DSE
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
							FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
4	0	2	-	-	2	3	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Data has become a valuable resource for organizations to make informed decisions and improve services. This course introduces the fundamental concepts of Data Science, including data collection, representation, analytics, applications, and ethical use of data. It enables students to understand how data is transformed into meaningful information and insights. The course also familiarizes students with emerging trends and career opportunities in Data Science. The knowledge gained will serve as a foundation for advanced studies in Data Analytics, Artificial Intelligence, and related domains.

B) EXPECTED SKILL/s –

Students should be able to collect and organize data from various sources, interpret basic analytical results, and identify real-world applications of Data Science. They should also develop awareness of data privacy, ethics, and emerging trends in data-driven technologies.

C) COURSE OUTCOMES (COs)

1. Explain fundamental concepts of Data Science.
2. Acquire, pre process and manage datasets.
3. Perform exploratory data analysis and statistics.
4. Visualize data using appropriate tools.
5. Apply basic machine learning concepts.
6. Develop simple data science solutions using Python.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/Learning Outcomes (LOs)	CL Hrs./Week	FA-TH Max.	CO Mapped
I	Introduction to Data Science1.1 Data Science: Concepts and Applications1.2 Data vs Information vs Knowledge1.3 Evolution and Need of Data Science1.4 Data Science Lifecycle1.5 Types of Data: Structured, Semi-Structured and Unstructured Data1.6 Data Science Tools and Platforms1.7 Python for Data Science1.8 Role and Responsibilities of a Data Scientist	1. Explain the concepts and importance of Data Science. 2. Differentiate between various types of data. 3. Describe the Data Science lifecycle and tools.	**6**	**10**	**CO1**
II	Data Collection, Data Sources and Data Quality2.1 Sources of Data2.2 Primary and Secondary Data2.3 Internal and External Data Sources2.4 Data Collection Methods2.5 Surveys, Questionnaires and Observations2.6 Open Data and Public Datasets2.7 Data Quality Parameters (Accuracy, Completeness, Consistency, Timeliness)2.8 Data Cleaning Concepts2.9 Challenges in Data Collection	1. Identify different data sources. 2. Select suitable methods for data collection. 3. Evaluate data quality and pre-processing requirements.	**10**	**15**	**CO2**
III	Data Representation, Types and Storage3.1 Data Representation Techniques3.2 Data Formats: CSV, XML, JSON3.3 Database Concepts3.4 Relational and Non-Relational Databases3.5 Data Warehouses3.6 Data Lakes3.7 Metadata Concepts3.8 Introduction to Big Data3.9 Cloud-Based Data Storage	1. Describe various data storage mechanisms. 2. Explain different data formats and representations. 3. Identify suitable data storage solutions.	**6**	**10**	**CO3**
IV	Data Analytics Process and Decision Making4.1 Introduction to Data Analytics4.2 Data Analytics Process4.3 Types of Analytics: a) Descriptive Analytics b) Diagnostic Analytics c) Predictive Analytics d) Prescriptive Analytics4.4 Business Intelligence Concepts4.5 KPI and Dashboard Concepts4.6 Data-Driven Decision Making4.7 Data Storytelling Techniques	1. Explain the data analytics process. 2. Differentiate various analytics techniques. 3. Use analytical insights for decision making.	**10**	**15**	**CO4**
V	Data Science Applications and Ethics5.1 Data Science Project Workflow5.2 Applications of Data Science in Healthcare5.3 Applications in Banking and Finance5.4 Applications in Education and Agriculture5.5 Applications in E-Commerce and Social Media5.6 Data Privacy Concepts5.7 Data Protection Principles5.8 Ethical Issues in Data Science5.9 Bias, Fairness and Transparency5.10 Responsible Use of Data	1. Explain real-world applications of Data Science. 2. Describe project workflow in Data Science. 3. Apply ethical principles in handling data.	**6**	**10**	**CO5**
VI	Emerging Trends in Data Science6.1 Artificial Intelligence and Data Science6.2 Internet of	1. Explore emerging technologies related to	**7**	**10**	**CO6**

	Things (IoT) and Data Analytics6.3 Smart Cities and Data Science6.4 Generative AI and Data Science6.5 Real-Time Data Analytics6.6 Future Trends in Data Science6.7 Career Opportunities in Data Science6.8 Case Studies of Data-Driven Organizations	Data Science. 2. Identify future trends and career opportunities. 3. Analyze case studies of Data Science applications.			

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Title	Learning Outcome (LO)	Hrs.	CO
1	Study Data Science concepts, lifecycle and applications	Understand basic concepts and lifecycle of Data Science	2	CO1
2	Identify structured, semi-structured and unstructured data using examples	Differentiate types of data in real-world scenarios	2	CO1
3	Identify data sources (primary & secondary) and collect sample data	Select appropriate data sources for data collection	2	CO2
4	Design a simple questionnaire for data collection	Apply data collection techniques effectively	2	CO2
5	Analyze data quality parameters (accuracy, completeness, consistency)	Evaluate data quality in datasets	2	CO2
6	Study CSV, JSON and XML data formats using sample datasets	Interpret different data representation formats	2	CO3
7	Convert data between formats (CSV ↔ JSON)	Apply data representation techniques	2	CO3
8	Study basic database structure using tables and relations	Understand data storage concepts	2	CO3
9	Identify types of analytics using case study	Differentiate descriptive, diagnostic, predictive, prescriptive analytics	2	CO4
10	Create simple KPI dashboard using Excel/Google Sheets	Apply visualization for decision making	2	CO4
11	Case study on Data Science applications (Healthcare/Banking/Education)	Analyze real-world applications of Data Science	2	CO5
12	Case study on emerging trends (AI, IoT, Generative AI)	Explore future trends in Data Science	2	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Self-Learning

- Study and prepare a report on real-world applications of Data Science in any one domain (healthcare, banking, education, agriculture).
- Create a presentation on Data Science lifecycle with a suitable example dataset.
- Compare structured, semi-structured, and unstructured data with real-life examples.
- Prepare a note on Data Science tools and platforms used in industry.

- Analyze any open dataset and write key observations and insights.
- Prepare a case study on recommendation systems (Netflix/Amazon/YouTube).
- Write a report on data privacy, security, and ethical issues in Data Science.
- Explore career opportunities and future trends in Data Science and AI.

Assignment

- Solve assignment covering all COs given by teacher

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Desktop Computer / Laptop (Intel i3 or higher, 8 GB RAM, 256 GB SSD)	All LLOs
2	Python 3.x Installed Environment	All LLOs

H) **SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE**

Unit No.	Unit Title	Teaching Hours	R Level	U Level	A Level	Total Marks
I	Introduction to Data Science	6	3	5	2	10
II	Data Collection, Data Sources and Data Quality	10	3	5	7	15
III	Data Representation, Types and Storage	6	2	4	4	10
IV	Data Analytics Process and Decision Making	10	3	6	6	15
V	Data Science Applications and Ethics	6	3	4	3	10
VI	Emerging Trends in Data Science	7	4	4	2	10
	Total	45	18	28	24	70

I) ASSESMENT TOOL –

6) Formative assessment

4) Continuous assessment based on process and product related performance indicators
5) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
6) A continuous assessment-based term work

7) Summative Assessment

3) Lab performance, Viva voice.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	Joel Grus	Data Science from Scratch: First Principles with Python	O'Reilly Media, ISBN: 978-1492041139
2	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	An Introduction to Statistical Learning	Springer, ISBN: 978-1461471370
3	Cathy O'Neil, Rachel Schutt	Doing Data Science	O'Reilly Media, ISBN: 978-1449358655
4	Jake VanderPlas	Python Data Science Handbook	O'Reilly Media, ISBN: 978-1491912058
5	John D. Kelleher, Brendan Tierney	Data Science	MIT Press, ISBN: 978-0262525045

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1	https://www.kaggle.com
2	https://www.python.org
3	https://pandas.pydata.org
4	https://numpy.org
5	https://matplotlib.org
6	https://seaborn.pydata.org
7	https://scikit-learn.org
8	https://www.geeksforgeeks.org/data-science/
9	https://towardsdatascience.com

K) CO-PO Matrix –

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	–	1	1	1	1	2
CO2	3	2	2	1	2	–	1	1	1	1	2
CO3	3	2	2	2	2	–	1	1	1	1	2
CO4	2	3	3	3	3	–	2	2	1	2	3
CO5	1	2	1	1	1	–	3	3	1	1	2
CO6	1	2	1	1	1	–	2	3	1	2	3

Legends:-High: 03, Medium:02, Low:01, No Mapping:-

SEMESTER VI

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Industrial Management for IT Industry
Course code	R23CP1408
Course Category	AEC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	-	1	4	2	3	30	70	100	40	-	-	-	-	25	10	125

Abbreviations:
CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This syllabus aims to develop managerial, organizational, financial, and ethical competencies among IT students. It integrates management fundamentals with software development, Agile practices, HRM, finance, digital asset management, marketing, and project management relevant to the IT industry. The inclusion of Indian Knowledge Systems (IKS) provides ethical, leadership, and sustainability perspectives rooted in Indian philosophy. Overall, the course prepares students to become industry-ready, responsible, and effective professionals in modern digital organizations.

B) EXPECTED SKILL/s –

Students will gain the ability to apply management and organizational principles in IT, work effectively in teams, and support decision-making using financial and data-driven insights. They will also develop leadership, ethical awareness, asset management, and professional skills required for modern digital workplaces.

C) COURSE OUTCOMES (COs)

Students will be able to -

1. Apply fundamental management principles and functions to IT, SDLC, and Agile project environments.
2. Analyse organizational structures, authority systems, and communication practices in IT and software organizations.

3. Explain and apply HRM practices for recruitment, skill development, motivation, and performance management in IT teams.
4. Interpret financial statements, budgeting methods, and taxation basics relevant to IT projects and services.
5. Apply digital resource, IT asset, inventory control, and sustainable computing practices in IT organizations.
6. Explain marketing, product life cycle, project management, and ethical practices in the IT industry.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	**Management Fundamentals for IT Industry** **1.1**.Meaning, nature, need and importance of management for IT and computer engineers **1.2**.Levels of management in IT organizations **1.3**.Functions of management: Planning, Organizing, Staffing, Directing and Controlling (POSDC) **1.4**.Application of POSDC to SDLC and Agile-based software projects **1.5**.Principles of management by Henri Fayol with IT workplace with examples **1.6**.Motivation and leadership for software professionals **1.7**.Introduction to data-driven management and management dashboards **IKS**: Chanakya's leadership and planning principles	**1.1** Explain the concepts, need, and importance of management in the IT and software industry. **1.2** Identify levels of management and describe their roles in IT organizations. **1.3** Apply management functions (POSDC) in software development processes such as SDLC and Agile. **1.4** Illustrate Fayol's principles of management with real-world IT examples. **1.5** Demonstrate leadership, motivation, and confidence-building skills in IT environments. **1.6** Interpret the role of data-driven decision-making using dashboards and analytics tools.	**8**	**15**	**CO1**
2	**Organization & Work Systems in IT Companies** **2.1**Concept and importance of organization in software and IT companies **2.2**Organizational structures in IT industry: 1) Functional 2) Project-based 3) Matrix 4) Agile / Scrum teams **2.2**.Departmentation in IT organizations **2.3**.Authority, responsibility and accountability in IT teams **2.4**.Centralized and decentralized decision-making **2.5**.Communication systems in IT companies **2.6**.Remote and hybrid work systems **2.7**.Professional conduct and teamwork in digital workplaces **IKS:** Gurukul mentorship system vs Tech Lead–Developer model	**2.1** Describe organizational concepts used in IT and software companies. **2.2** Differentiate between functional, project, matrix, and agile organizational structures. **2.3** Explain authority, responsibility, and accountability in IT teams. **2.4** Compare centralized and decentralized decision-making approaches. **2.5** Explain departmentation and communication systems in remote and hybrid teams. **2.6** Demonstrate teamwork and professional conduct in digital workplaces.	**07**	**10**	**CO2**

3	**Unit III: Human Resource Management in IT Sector** **3.1**Meaning, scope and importance of HRM in IT organizations **3.2**HRM functions in software companies **3.3**Manpower planning and recruitment processes in IT sector **3.4**Training, upskilling and reskilling in emerging technologies **3.5**Scientific management concepts applied to software productivity **3.6**Motivation theories and leadership styles for IT teams **3.7**Performance appraisal, KPIs and work ethics **3.8**Wages, incentives and compensation basics in IT industry **IKS:** Karma Yoga and professional responsibility	**3.1** Explain the functions and importance of HRM in IT organizations. **3.2** Describe manpower planning and recruitment processes in the IT sector. **3.3** Identify training, up skilling, and reskilling needs in emerging technologies. **3.4** Apply scientific management principles to improve productivity in software projects. **3.5** Analyse motivation theories and leadership styles in IT teams. **3.6** Explain performance appraisal systems, KPIs, and ethical work practices. **3.7** Describe wage structures, incentives, and compensation systems in IT companies.	**08**	**10**	**CO3**
4	**Unit IV: Financial Management & Taxation for IT Projects** **4.1**Concept and importance of financial management for IT engineers **4.2**Capital requirements for IT startups and software projects **4.3**Budgeting and cost estimation for software development **4.4**Financial statements of IT firms: 1) Profit and Loss Statement 2) Balance Sheet **4.5**Financial ratios – concept and significance **4.6**Basics of taxation and GST applicable to software services **IKS:** Ancient Indian trade and finance concepts	**4.1** Explain basic financial management concepts for IT professionals. **4.2** Estimate capital and budget requirements for IT projects and startups. **4.3** Prepare basic cost estimates for software development. **4.4** Interpret financial statements such as Profit & Loss Account and Balance Sheet. **4.5** Analyse basic financial ratios for business performance evaluation. **4.6** Explain taxation concepts and GST applicability in IT services.	**07**	**10**	**CO4**
5	**Unit V: Digital Resource & Asset Management** **5.1**Concept and classification of digital resources and IT assets **5.2**IT Asset Management: software licenses, servers and cloud resources **5.3**Inventory control techniques applied to IT assets: 1) ABC analysis 2) EOQ 3) Just-in-Time (JIT) **5.4**ERP systems – concept andapplications. **5.5**CRM systems – concept and applications **5.6**Green IT and sustainable computing practices **IKS**: Indian philosophy of resource conservation	**5.1** Explain the concept and classification of digital resources and IT assets. **5.2** Manage IT assets such as software licenses, servers, and cloud resources. **5.3** Apply inventory control techniques like ABC analysis, EOQ, and JIT. **5.4** Describe the role and applications of ERP systems in organizations. **5.5** Explain CRM systems and customer data handling practices. **5.6** Illustrate Green IT practices and sustainable computing concepts.	**07**	**10**	**CO5**

6	**Unit VI: IT Marketing, Product & Project Management** **6.1**Marketing management concepts for IT and software products **6.2**Digital marketing tools and techniques **6.3**Product life cycle of software applications **6.4**Project management concepts for IT projects **6.5** Overview of Agile methodology **6.6** Business ethics in IT organizations **6.7**Data privacy, cyber security awareness and responsible computing **IKS:** Dharma and ethical practices in information technology	**6.1** Explain marketing concepts for software products and IT services. **6.2** Identify digital marketing tools and techniques used in the IT industry. **6.3** Describe the product life cycle of software applications. **6.4** Explain basic project management concepts and Agile methodology. **6.5** Demonstrate awareness of business ethics, data privacy, and responsible computing practices.	**08**	**15**	**CO6**

E) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

1) **Activities:** Scrum role-play, Agile case discussions, financial statement analysis, asset classification(ABC), sustainability posters
2) **Assignments:** Case studies on decision-making, motivation, remote work, GST, ERP/CRM, ethics and data privacy
3) **Industrial Visit:** IT/Software company, start-up, ERP/CRM provider or data centre with post-visit report
4) **Skills Developed:** Organizational understanding, communication, teamwork, leadership, financial literacy, ethical awareness, analytical and industry-ready skills

Note:

1) Above is just a suggestive list of assignments; faculty must prepare their own bank of assignments, and activities in a similar way.
2) If a microproject is assigned, it is expected to be completed as a group activity.
3) SLA marks shall be awarded as per the continuous assessment record.

F) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Management Fundamentals for IT Industry	8	4	11	0	15
2.	Organization & Work Systems in IT Companies	7	4	6	0	10
3.	Human Resource Management in IT Sector	8	5	5	0	10
4.	Financial Management & Taxation	7	4	6	2	10
5.	Digital Resource & Asset Management	7	4	5	2	10
6.	IT Marketing, Product & Project Management	8	5	10	0	15
	Total	**45**	**26**	**40**	**04**	**70**

G) ASSESSMENT TOOL –

1) **Formative assessment**
   Continuous assessment–based term work including assignments, presentations, quizzes, role-play activities, and industrial visit reports.
2) **Summative Assessment**
   End-semester written examination assessing conceptual understanding, application of management principles, problem-solving, and analytical skills in contexts.

H) LEARNING RESOURCES

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	V. S. Pande & B. S. Basak	Industrial Management	Himalaya Publishing House, Mumbai (Classic MSBTE-aligned book covering management, HR, finance, marketing)
2	O. P. Khanna	Industrial Management	Dhanpat Rai Publications (Strong fundamentals)
3	Raghuram G. Rajan & Julie Wulf	Management Practices	Pearson Education India (For organization, leadership, and decision-making basics)
4	Harold Koontz & Heinz Weihrich	Essentials of Management	McGraw-Hill Education
5	Stephen P. Robbins	Organizational Behaviour	Pearson Education

- **WEBSITES LINKS**

Sr.No.	Link / Portal
1	https://www.linkedin.com/learning
2	https://www.udemy.com/
3	https://asq.org/quality-resources/quality-management-system
4	https://www.coursera.org/courses?query=industrial
5	https://swayam.gov.in/explorer?category=Management

Note:

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	-	-	2	1	1	1	-
CO2	2	2	1	-	-	1	1	1	1	-
CO3	2	1	1	-	1	2	1	1	1	-
CO4	2	1	1	-	-	2	-	1	-	-
CO5	2	1	1	1	2	1	1	1	1	1
CO6	2	1	2	1	-	2	1	2	1	1

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	**Computer Engineering**
Course Name	Emerging Trends in Computer Engineering
Course Code	R23CP2410
Course Category	DSC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					**Credits**	**Paper Duration (hrs.)**	**Assessment Scheme**										
Contact Hrs./Week			**Self-Learning (Term Work + Assignment)**	**Notional Learning Hrs / Week**			**Theory**				**Practical (Based on LL & TL)**				**Based on Self Learning**		**Total Marks**
CL	**TL**	**LL**					**FA-TH**	**SA-TH**	**Total**		**FA-PR**		**SA-PR**		**SLA**		
							Max	**Max**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	
3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175

Abbreviations:
CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment,SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning Assessment. Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

This course introduces students to emerging computing technologies such as Artificial Intelligence, Internet of Things, immersive technologies, quantum computing, cyber security, and digital forensics. It provides a foundational understanding of modern technological trends and their applications in real-world scenarios. The course emphasizes the integration of advanced technologies in solving practical problems, understanding security and ethical aspects, and analyzing their impact on society, industry, and the environment. It also prepares students to adapt to rapidly evolving technological landscapes and supports lifelong learning in advanced computing domains.

B) EXPECTED SKILL/s

The expected skill set of this course is to enable students to attain the following Industry Identified Outcome through various teaching-learning experiences: apply emerging computing technologies, including AI/ML and IoT, to design practical systems, evaluate advanced paradigms, and address cyber security and digital forensics challenges in real-world scenarios.

C) COURSE OUTCOMES (COs)

The students will be able to

1] Apply Technology Readiness Levels (TRLs) to assess the maturity and deployment feasibility of emerging technologies.

2] Elaborate the role of Artificial Intelligence, Machine Learning and Deep Learning in various domains.

3] Identify appropriate IoT communication types, protocols, and technologies for real-world scenarios.
4] Analyze immersive, quantum, and green computing technologies in terms of their applications and challenges.
5] Implement cyber security tools to identify and mitigate potential threats.
6] Explain digital forensics, cyber laws, and security practices for cybercrime investigation and data protection.

D) COURSE CONTENTS

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FA - TH MAX.	CO Mapped
1	**Introduction** **1.1 Need for Emerging** Technologies in modern computing environments **1.2 Emerging Computing Trends** Evolution of computer systems, Essential features of modern computing systems, Integration of emerging computing domains **1.3 Impact of Emerging Trends** Impact on industrial practices, Workforce and employment, Society and daily life **1.4 Technology Readiness** Technology life cycle, Technology Readiness Levels (TRLs), TRL standardized scale **1.5 Challenges of Emerging Technologies:** Technical and infrastructure challenges, Security and privacy challenges, Ethical challenges, Legal and regulatory challenges, Social and workforce challenges, Economic and adoption challenges	TLO 1.1 Explain the importance of emerging technologies TLO 1.2 Describe modern computing needs TLO 1.3 Evaluate impact of emerging trends TLO 1.4 Interpret technology Readiness Level TLO 1.5 Identify challenges in emerging technologies	**07**	**10**	**CO1**
2	**Essentials of Artificial Intelligence and Generative AI** **2.1 Artificial Intelligence (AI)** History and evolution of Artificial Intelligence, Difference between Human Intelligence and Artificial Intelligence **2.2 Classification of Artificial Intelligence** **2.2.1** Types based on learning way – Machine Learning, Deep Learning **2.2.2** Based on system capabilities- ANI, AGI, ASI **2.2.3** Based on system functionality - Reactive machines, Limited memory AI, Theory of mind AI, Self-aware AI **2.3AI, ML, and DL: Conceptual Overview** Role of Machine Learning in Artificial Intelligence, Basic types of Machine Learning-	TLO 2.1: Differentiate Artificial Intelligence and Human Intelligence. TLO 2.2: Explain Artificial Intelligence based on learning approaches, system capabilities, and functionality. TLO 2.3: Describe the types of Machine Learning such as supervised, unsupervised, and reinforcement learning. TLO 2.4: Identify real-world applications of Artificial Intelligence, Machine Learning, and Deep Learning.	**07**	**10**	**CO2**

	Supervised Learning, Unsupervised Learning, Reinforcement Learning				
3	**Internet of Things (IoT)** **3.1** IoT fundamentals, Evolution, Key characteristics, Three-layer, Seven-layer IoT architecture **3.2Communication Types and Protocols** Human to Machine(H2M), Machine to Machine(M2M), Machine to Human **Protocols**- Message Queuing Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Hyper Text Transfer Protocol (HTTP), Advanced Message Queuing Protocol(AMQP) **3.3 Communication Technologies** **Wired Communication**– Ethernet, Serial communication (UART,RS232,RS485) **Wireless Communication -** Wi-Fi, Bluetooth, Zigbee, Cellular communication (4G/5G,NB-IoT), LoRaWAN	TLO 3.1: Explain IoT fundamentals, evolution, key characteristics, and IoT architectures (three-layer and seven-layer). TLO 3.2: Identify IoT communication types such as H2M, M2M, and M2H. TLO 3.3: Explain IoT communication protocols including MQTT, CoAP, HTTP, and AMQP. TLO 3.4: Describe wired and wireless communication technologies.	**09**	**15**	**CO3**
4	**Immersive, Quantum, and Sustainable Computing Technologies** **4.1** Introduction to immersive technologies, Definition, Working principle, Difference between traditional interfaces and immersiveinterfaces, Characteristics of immersive systems **4.2 Quantum Computing:** Need for quantum computers,Core quantum principles- Qubits, Superposition, Entanglement, Decoherence, Interference **Difference between classical computers and quantum computers** Advantages, disadvantages, applications and challenges **4.3 Green Computing** Need for green computing, Objectives, Characteristics, Technologies supporting green computing systems, E-Waste recycling process, Green computing scenario in India	TLO 4.1: Explain immersive technologies, their principles, characteristics, and differences from traditional interfaces. TLO 4.2: Differentiate quantum computing with classical computing. TLO 4.3: Explain the advantages, disadvantages, applications, and challenges of quantum computing. TLO 4.4:Illustrate green computing technologies, e-waste recycling, and the scenario in India.	**07**	**10**	**CO4**
5	**Cyber Threats and Ethical Hacking** **5.1 Cyber Threats and Security Principles:** Types of cyber threats- Malware, Phishing, Ransomware, Social Engineering. Basic security principles (CIA Triad) **5.2 Ethical Hacking Fundamentals:** Definition of ethical hacking, Purpose of ethical hacking in cybersecurity, Types of hackers - White Hat, Black Hat, Grey Hat. Ethical responsibilities and legal boundaries **5.3 Types of Hacking:** **5.3.1 Network Hacking** - AI-powered phishing scams, Ransomware 2.0, IoT exploits, Cloud threats,	TLO 5.1: Identify different types of cyber threats and explain basic security principles such as the CIA triad. TLO 5.2: Explain the fundamentals of ethical hacking, including its purpose, types of hackers, and legal responsibilities. TLO 5.3: Examine types of hacking including network, operating system, and application techniques.	**08**	**15**	**CO5**

	Deepfake technology **5.3.2 Operating System Hacking** **5.3.3 Application Hacking:** Advanced Web Application Firewall (WAF) bypass techniques, Zero-day exploits **Attack preventing tools-**Kali Linux, Nmap, Wireshark	TLO 5.4: Recognize modern cyber threats such as AI-powered phishing, ransomware, IoT exploits, cloud threats, and deepfake attacks. TLO 5.5: Implement attack prevention and analysis tools such as Kali Linux, Nmap, and Wireshark.			
6	**Digital Forensics and Cyber Regulations** **6.1 Introduction to Digital Forensics:** Concept of digital forensics, Importance in cybercrime investigation, Types of digital evidence, Steps in forensic investigation, Forensic tools: Autopsy, Wireshark **6.2 Cyber Law & Data Protection:** Purpose of Cyber Law, Key laws in India-Information Technology Act, 2000, Digital Personal Data Protection Act, 2023 **6.3 Emerging Security Awareness:** SOC (Security Operations Center), Block chain, OT Security	TLO 6.1: Explain the concept, importance, types of digital evidence, and steps involved in digital forensic investigation. TLO 6.2: Describe digital forensic tools such as Autopsy and Wireshark used in cybercrime analysis. TLO 6.3: Explain the purpose of cyber laws and key regulations in India including the IT Act 2000 and DPDP Act 2023. TLO 6.4: Describe the role and functions of a Security Operations Center (SOC) in cyber security. TLO 6.5: Explain emerging security concepts such as blockchain and OT security.	**07**	**10**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant COs
1	Case study on impact of emerging trends in society and daily life	*LLO1.1 — Analyze the impact of emerging technologies on society, industry, and daily life through case studies.	**2**	**CO1**
2	Identify and analyze challenges while applying emerging trends into project	LLO2.1 — Identify and evaluate technical, ethical, and implementation challenges in applying emerging technologies.	1	**CO1**
3	Implement and analyze supervised learning for a large, labelled dataset	*LLO3.1 — Implement supervised learning techniques on labelled datasets and evaluate model performance.	**2**	**CO2**

4	Analysis of the impact of emerging technologies	LLO4.1 — Analyze the influence of emerging technologies across different domains and present findings.	1	**CO1**
5	Apply the Technology Readiness Level (TRL) framework (1–9) to your project	*LLO5.1 — Apply TRL framework to assess the maturity level of a technology or project.	**2**	**CO1**
6	Explore Artificial Intelligence Concepts through Film Analysis	*LLO6.1 — Interpret AI concepts and societal implications through media analysis and critical thinking.	**2**	**CO2**
7	Creating a 360-Degree Virtual Environment for different applications	*LLO7.1 — Develop a basic immersive environment using 360-degree visualization techniques.	**2**	**CO4**
8	Create an Augmented Reality Experience	*LLO8.1 — Design and demonstrate an augmented reality application integrating virtual objects with real-world views.	**2**	**CO4**
9	Simulation of MQTT Communication Protocol	*LLO9.1 — Simulate MQTT protocol to understand message publishing, subscribing, and IoT communication.	**2**	**CO3**
10	Designan IoT-Based Smart Application	*LLO10.1 — Design and implement a basic IoT-based smart system using sensors and communication technologies.	**2**	**CO3**
11	Develop a Simple IoT Dashboard using Node-RED	*LLO11.1 — Develop a Node-RED dashboard to visualize and monitor IoT data in real time.	**2**	**CO3**
12	Implement an ethical hacking technique in a controlled environment.(Any one type of Network hacking)	*LLO12.1 — Perform a network-based ethical hacking technique in a controlled environment.	**2**	**CO5**
13.	Vulnerability Assessment in Capstone Project	*LLO 13.1 — Identify and remediate vulnerabilities in the capstone project using appropriate tools and techniques.	**2**	**CO5**
14.	Security Analysis in Real-Time Application Scenario	LLO 14.1 —Analyze and mitigate security flaws in real-time application scenarios using ethical hacking approaches.	**2**	**CO5**
15.	Digital Evidence Analysis using Autopsy	LLO15.1 — Analyze digital evidence using forensic tools like Autopsy following standard investigation procedures.	**2**	**CO6**
16.	Case Study on Cyber Law and Data Protection	*LLO 16.1 — Interpret provisions of cyber laws (IT Act 2000, DPDP Act 2023) in real-world data protection scenarios.	**2**	**CO6**

Note: Out of above suggestive LLOs-

- '*'Marked Practical's (LLOs) are mandatory.
- Minimum 80% of above list of lab experiments are to be performed.
- Judicial mix of LLOs is to be performed to achieve desired outcomes.

F) SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/SKILLSDEVELOPMENT(SELFLEARNING)

Assignment

- Case studies on relevant topics.

G) LABORATORYEQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED

Sr.No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	• Desktop / Laptop Computer • Relevant Open-Source Simulator • Virtual Labs	ALL

H) SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No.	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction Emerging Technologies	CO1	07	02	06	02	10
2	II	Essentials of Artificial Intelligence and Generative AI	CO2	07	04	04	02	10
3	III	Internet of Things	CO3	09	04	07	04	15
4	IV	Immersive, Quantum, and Sustainable Computing Technologies	CO4	07	04	04	02	10
5	V	Cyber Threats and Ethical Hacking	CO5	08	04	07	04	15
6	VI	Digital Forensics and Cyber Regulations	CO6	07	04	04	02	10
Grand Total				**45**	**22**	**32**	**16**	**70**

I) ASSESMENT TOOL –

1) Formative assessment

1) Continuous assessment based on process and product related performance indicators

Summative Assessment

1) End semester examination, viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title	Author	Publisher with ISBN Number
1	Artificial Intelligence, Machine Learning and Deep Learning	Oswald Campesato	Mercury Learning and Information ISBN: 978-1-68392-467-8
2	Introduction to Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media ISBN: 978-1-449-36941-5

3	The Hundred-Page Machine Learning Book	Andriy Burkov	-
4	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill Education (India) ISBN-13: 978-93-5260-522-4
5	Virtual & Augmented Reality For Dummies	Paul Mealy	Wiley ISBN: 978-1-119-48134-8
6	Hacking: Beginner to Expert Guide to Computer Hacking, Basic Security, and Penetration Testing	James Patterson	-

- **WEBSITES LINKS**

Sr. No	Link / Portal	Description
1	https://microsoft.github.io/AI-For-Beginners/	Artificial Intelligence for beginner's course
2	https://developers.google.com/machine-learning/crash-course	Machine Learning crash course
3	https://iterasec.com/blog/understanding-ai-attacks-and-their-types/	Types of AI attacks
4	https://www.versatek.com/wp-content/uploads/2016/06/IoT-eBook-version5.pdf	eBook on Internet of Things
5	https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf	IoT tutorial eBook
6	https://www.youtube.com/watch?v=iqjcNRJf-Nc	Immersive technology (VR/AR)
7	https://www.youtube.com/watch?v=ScqopKqK6v0	Immersive technology applications
8	https://www.tutorialspoint.com/ethical_hacking/ethical_hacking_process.htm	Ethical hacking process
9	https://www.cm-alliance.com/cybersecurity-blog/5-ways-to-avoid-ai-owered-hacking	AI-powered attack protection
10	https://www.infosecinstitute.com/resources/digital-forensics/digital-forensics-models/#gref	Digital forensics models
11	https://www.researchgate.net/publication/300474145_Digital_Forensics/	Digital forensics eBook
12	https://www.indiacode.nic.in/bitstream/123456789/13116/1/it_act_2000_updated.pdf	IT Act 2000
13	https://www.indiacode.nic.in/bitstream/123456789/15386/1/it_amendment_act2008.pdf	IT Act 2008 Amendment
14	https://www.meity.gov.in/static/uploads/2024/06/2bf1f0e9f04e6fb4f8fef35e82c42aa5.pdf	IT Act 2023 (DPDP)
15	https://www.infosys.com/about/springboard.html	Digital learning & reskilling platform

K) CO-PO Matrix –

Course Outcomes(COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO 1	3	-	1	-	1	-	1	-	-	1
CO 2	3	2	2	1	-	-	-	1	1	-
CO 3	2	-	2	1	1	-	-	2	-	-
CO 4	2	1		1	1	-	-	–	2	
CO 5	3	3	2	3	2	1	1	3	-	1
CO 6	2	2	2	2	3	1	1	2	–	1

Legends: -High:03,Medium:02,Low:01,No Mapping: -

Cusrow Wadia Institute of Technology, Pune-1

Diploma Programme	Computer Engineering
Course Name	Machine Learning
Course code	R23CP2411
Course Category	DSC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	4	1	8	4	3	30	70	100	40	25	10	25	10	25	10	175

Abbreviations:

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment. Legends: @ Internal Assessment, # External Assessment, *# OnlineExamination, @$ Internal Online Examination

A) RATIONALE

Machine Learning is a core domain of Artificial Intelligence that enables computer systems to learn from data and improve their performance without being explicitly programmed. It provides techniques and algorithms for data analysis, prediction, and decision-making. Knowledge of Machine Learning is essential for computers to develop intelligent systems, analyze large datasets, and build predictive models for real-world applications across various domains.

B) EXPECTED SKILL/s –

Apply Machine Learning techniques using Python for data preprocessing, model development, and analysis of real-world problems.

C) COURSE OUTCOMES (COs)

CO1: Explain fundamental concepts, types, and real-world applications of Machine Learning.
CO2: Apply Python programming and standard libraries (NumPy, Pandas, Matplotlib, Scikit-learn).
CO3: Apply data preprocessing techniques.
CO4: Analyze feature engineering techniques.
CO5: Implement and evaluate supervised learning algorithms.
CO6: Apply and analyze unsupervised learning techniques.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1	Introduction: 1.1 Introduction to Machine Learning – Definition of Machine Learning, Traditional programming vs ML-based approaches, Role and applications of ML in Artificial Intelligence and Data Science. 1.2 Types of Machine Learning – Supervised Learning (definition, working principle, examples: classification and regression), Unsupervised Learning (definition, working principle, examples, clustering, dimensionality reduction techniques), Reinforcement Learning (concept of agent, environment, reward, and policy learning). 1.3 Applications of Machine Learning – Real-world applications of ML in healthcare, finance, e-commerce, education, social media, Challenges in Machine Learning.	LO 1.1: Define Machine Learning and explain its concept. LO 1.2: Differentiate between traditional programming and ML approaches. LO 1.3: Identify applications of Machine Learning in various domains.	7	10	CO1
2	Basics of data, ML Environment Setup & Libraries 2.1Introduction to data and its types: - Data, dataset, qualitative data, quantitative data. Types of qualitative data -nominal and ordinal data. Types of quantitative data- interval and ratio. Exploring structure of data -understanding central tendency (concept of mean and median), data spread (concept of variance and standard deviation). 2.2 Platforms / IDE: - Anaconda, Google Colab, Jupyter Notebooks. Python scripts for ML (.ipynb / .py). 2.3 Core Libraries: - NumPy: Introduction, Use, Features. NumPy Arrays – 1D array, 2D array, Multidimensional, functions - np.array(), Array Indexing (1D and multidimensional arrays), Slicing Arrays (1D and multidimensional arrays), Reshape NumPy Array (reshape()), numpy.mean(), numpy.resize(), array.resize(), Random sampling in numpy(random.randint()). Pandas: Introduction, Use. Pandas Series	LO 2.1 – Introduction to Data and Its Types: Define data and datasets, classify data into qualitative (nominal, ordinal) and quantitative (interval, ratio) types, and explain their characteristics. LO 2.2 – ML Environment Setup & IDEs: Set up a Machine Learning development environment using Anaconda, Google Colab, or Jupyter Notebooks, and create/run Python scripts (.ipynb / .py) for ML tasks.	9	15	CO2

	(Series ()). DataFrame (DataFrame()) Functions: -read_csv(), read_excel(), head(), tail(), info(), describe(), value_counts(). Matplotlib: Components or Parts of Matplotlib Figure, Matplotlib Pyplot, Features and uses. Different Types of Plots: - line graph, bar chart, histogram, Scatter plot, pie chart, box plot, error plot, 3D plots. Scikit-learn: Introduction, features, benefits				
3	**Data pre-processing:** 3.1 Data understanding: steps of data understanding, data preparation, importance of data preparation, data pre-processing, and advantages. 3.2 Data preparation: Data preparation process steps, data collection, data cleaning, advantages. Data transformation: scaling, normalization, standardization, binarization, encoding, label encoding, log transformation, Data reduction, data splitting. 3.3 Data visualization, types of data visualization -univariate plots, multivariateplots, exploratory data analysis, steps for performing EDA. checking dimensions: df.shape , listing features:df.columns, Data Selection & Slicing: Selecting specific columns and rows using loc[] and iloc[], Selecting rows and columns using loc[] (Integer-Position Based Indexing), Difference between loc[] and iloc[] indexing methods 3.4 Data Cleaning & Handling Missing Values (Functions): Identifying Missing Values: df.isnull(), df.isnull().sum(). Techniques to Handle Missing Values: df.dropna(). Replace Empty Values, Replace Only for Specified Columns: dropna(), fillna(), Removing Duplicate and Inconsistent Data: df.duplicated(), df.drop_duplicates(): Remove duplicates, Pandas dataframe.replace() 3.5Data Imputation Techniques: Missing Completely at Random (MCAR), Missing at Random (MAR), Missing Not at Random (MNAR), Importance of Data Imputation, Imputation Techniques. Mean/Median Imputation, Mode Imputation, Data Pre-Processing with Sklearn using Standard and	LO 3.1 – Data Understanding: Explain data understanding, preparation, and preprocessing in ML. LO 3.2 – Data Preparation & Transformation: Collect, clean, and transform data using scaling, normalization, encoding, and splitting. LO 3.3 – Data Visualization & EDA: Explore data with EDA, create visualizations, and manipulate data using Pandas functions.	7	10	CO3

	MinMaxScaler(), Scaling Techniques: Standardization using StandardScaler(). Normalization using MinMaxScaler(). Outlier Detection (Visualization): Generating a Box plot using plt.boxplot() to detect noisy data. Dimensionality Reduction Technique: Feature Selection, Feature Extraction, Real World Use Case				
4	**Feature Engineering and Feature Selection:** **4.1 Feature Engineering**– Concept, Importance of Feature Engineering, Processes Involved in Feature Engineering, Steps in Feature Engineering, Common Techniques in Feature Engineering (One-Hot Encoding, Binning, Text Data Pre-processing, Feature Splitting), Tools for Feature Engineering. Dimensionality Reduction- Introduction, working, Dimensionality Reduction Techniques (Feature Selection, Feature Extraction), Real World Use Case, Advantages, Disadvantages. **4.2 Feature Selection Techniques in Machine Learning**–concept, Need of Feature Selection, Types of Feature Selection Methods- Filter Methods (concept, techniques, advantages, limitations, Chi-Square Test, Pearson Correlation Coefficient), Wrapper methods (concept, techniques, advantages and disadvantages, Forward Feature Selection, Multiple Linear Regression with Backward Elimination), and Embedded methods (concept, techniques, advantages and limitations). **Feature Extraction –** Concept**,** Importance of Feature Extraction, Techniques for Feature Extraction, Applications, Tools and Libraries for Feature Extraction, advantages and challenges	LO 4.1 Describe the concept and importance of feature engineering and its common techniques. LO 4.2 Apply feature engineering methods such as encoding, binning, text preprocessing, and feature splitting. LO 4.3 Analyze dimensionality reduction techniques including feature selection and feature extraction with their advantages and limitations. LO 4.4 Analyze different feature selection methods (Filter, Wrapper, Embedded) and their techniques like Chi-Square and correlation.	9	15	CO4
5	**5. Supervised Learning:** **5.1 Types of Supervised Learning**– Classification and Regression. **Classification**– concept, Types of Classification (Binary Classification, Multiclass Classification, Multi-Label Classification) working of classification, types of classifiers algorithms - Linear Classifiers, Non-linear Classifiers, Examples of Machine Learning Classification in Real Life. **Regression**– Concept, list of Types of	LO 5.1 Explain supervised learning concepts including classification and regression techniques. LO5.2 Apply supervised algorithms such as Linear Regression, Logistic Regression, Decision Tree, KNN, SVM, and Naive Bayes. LO5.3 Analyze model performance using metrics like Accuracy, Precision, Recall,	7	10	CO5

	Regression algorithm and applications. **5.2 Supervised Machine Learning Algorithms-** **Linear Regression -** Concept, Types of Linear Regression (Simple Linear Regression, Multiple Linear Regressions), Use Cases, Advantages, Limitations. **Logistic Regression** -concept, Types of Logistic Regression (Binomial Logistic Regression, Multinomial Logistic Regression, Ordinal Logistic Regression) Assumptions, Sigmoid function. **Decision Tree** – concept, working, advantages, disadvantages and applications, **K-Nearest Neighbor (KNN) –** concept**,** 'K' in K Nearest Neighbor**,** Statistical Methods for Selecting k (Cross-Validation, Elbow Method, Odd Values for k), Working of KNN algorithm, Applications, advantages and disadvantages **Support Vector Machine (SVM)–**concept**,** working of SVM, Types of Support Vector Machine (Linear SVM, Non-Linear SVM), advantages and disadvantages. **Naive Bayes Classifiers – concept, Features, Assumption,** advantages and disadvantages. **5.3Model Performance Evaluation-** For classification – Confusion Matrix, Accuracy, Precision, Recall, F1 score, AUC-ROC For Regression –Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R-squared (R^2).	F1-score, AUC-ROC, MAE, MSE, RMSE, and R^2.			
6	**Unsupervised Learning** **6.1Types of Unsupervised Learning Algorithms- Clustering Algorithms, Association Rule Learning, Dimensionality Reduction** 6.2 Clustering–concept, Types of Clustering (Hard Clustering, Soft Clustering), Importance of clustering in data analysis, Applications of clustering. K-Means Clustering – concept, working, Use of K-Means Clustering, Challenges, Advantages, disadvantages and applications. DBSCAN Clustering–concept, Key Parameters in DBSCAN, working. 6.3 **Association Rule Learning**- Apriori Algorithm (concept, working, Key Metrics of	LO6.1 Distinguish different types of Unsupervised Learning including clustering, association rule learning, and dimensionality reduction. LO6.2 Apply clustering techniques like K-Means and DBSCAN to group data and analyze patterns. LO6.3 Use Apriori Algorithm to generate association rules using support, confidence, and lift. LO6.4 Explain PCA for dimensionality reduction and evaluate its advantages and limitations.	6	10	CO6

	Apriori Algorithm, applications). 6.4 **Dimensionality Reduction**- Principal Component Analysis (PCA)(concept, working, advantagesand disadvantages) Linear Discriminant Analysis (LDA) – concept, Key Assumptions of LDA, working, Advantages, Disadvantages and Applications				

E) PRACTICAL (BASED ON LLO'& TLO) ASSESSMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Installation of IDE with necessary libraries- numpy, pandas, Matplotlib, Scikit-learn.	LLO 1.1: Install and configure Python IDE and required libraries (NumPy, Pandas, Matplotlib, Scikit-learn) for Machine Learning tasks.	02	CO2
2.	To implement a Python program using the NumPy library to perform basic array operations, including: • Creation: Initialising multidimensional arrays using np.array(). • Random Generation: Generating discrete random integers using random.randint(). • Data Selection: Accessing specific elements and subsets through Slicing Arrays.	LLO 2.1: Implement NumPy programs to create multidimensional arrays using np.array().	02	CO2
3.	To demonstrate structural modifications and statistical computations on NumPy arrays using the following functions: • Reshaping: reshape() to change dimensions without altering data. • Resizing: Comparing numpy.resize() (returns new array) and array.resize() (modifies in-place). • Statistics: Calculating the central tendency using numpy.mean()	LLO 3.1: Apply NumPy functions to perform array reshaping, resizing, and compute statistical measures such as mean.	02	CO2
4.	To implement a Python script using Pandas to create data structures and load external datasets by utilizing the following functions: • Manual Creation: Series() and DataFrame(). • File Input: read_csv() and read_excel().	LLO 4.1: Create Pandas Series/DataFrame and load datasets using read_csv() and read_excel().	02	CO2

5.	To perform initial data exploration and statistical analysis on a Pandas DataFrame using the following inspection functions: • Structural Overview: head(), tail(), and info(). • Statistical Summary: describe() and value_counts().	LLO 5.1: Perform initial data exploration and statistical analysis on a Pandas DataFrame using functions like head(), tail(), info(), describe(), and value_counts().	02	CO2
6.	To implement a Python program using the matplotlib package to represent datasets through fundamental graphical forms, including line graphs, bar charts, histograms, and pie charts, to analyse trends, comparisons, and distributions.	LLO 6.1: Create basic data visualizations using Matplotlib such as line, bar, histogram, and pie charts.	02	CO2
7.	To implement a Python program using matplotlib to represent complex data relationships through advanced visualisations, including scatter plots, box plots, error plots, and 3D plots.	LLO 7.1: Create advanced visualizations using Matplotlib such as scatter plots, box plots, error plots, and 3D plots.	02	CO2
8.	To demonstrate the use of fundamental Pandas attributes and methods for inspecting and accessing data within a DataFrame, specifically focusing on df.shape, df.columns, loc[], and iloc[].	LLO 8.1: Inspect and access data in a DataFrame using df.shape, df.columns, loc[], and iloc[].	02	CO3
9.	To implement a Python script using Pandas to perform missing data analysis and treatment by identifying null entries using df.isnull() and df.isnull().sum(), and subsequently resolving them through deletion using df.dropna() or imputation using df.fillna().	LLO 9.1: Identify and handle missing data using df.isnull(), dropna(), and fillna() methods.	02	CO3
10.	To ensure data integrity within a dataset by detecting redundant records using the df.duplicated() function and performing data deduplication using the df.drop_duplicates() method to maintain unique observations.	LLO 10.1: Detect and remove duplicate records using df.duplicated() and df.drop_duplicates().	02	CO3
11.	To implement a Python script to handle missing data by performing: • Mean Imputation for continuous numerical data. • Median Imputation for skewed numerical data or data with outliers. • Mode Imputation for categorical data or discrete variables	LLO 11.1: Apply mean, median, and mode imputation techniques to handle missing data.	02	CO3
12.	To implement a Python program to perform feature scaling on numerical datasets using the following transformation techniques from the sklearn.preprocessing module:	LLO 12.1: Perform feature scaling using StandardScaler() and MinMaxScaler().	02	CO3

	• Standardization using StandardScaler(). • Normalization using MinMaxScaler()			
13.	Implement One Hot Encoding to convert categorical features into numerical format.	LLO 13.1: Convert categorical features into numerical format using One Hot Encoding.	02	CO4
14.	Perform data binning to group continuous values into meaningful intervals.	LLO 14.1: Apply data binning to group continuous values into meaningful intervals.	02	CO4
15.	Apply text preprocessing (lowercasing, stopword removal, tokenization) on textual data.	LLO 15.1: Perform text preprocessing using lowercasing, stopword removal, and tokenization.	02	CO4
16.	Perform feature splitting to divide combined attributes into meaningful features.	LLO 16.1: Split combined attributes into meaningful features.	02	CO4
17.	**Implement a Python program to build a Linear Regression model** for predicting continuous values and evaluate its performance using appropriate metrics.	LLO 17.1: Build and evaluate a Linear Regression model for predicting continuous values.	02	CO5
18.	**Develop a Python program for Logistic Regression** to perform classification and assess model accuracy on a dataset.	LLO 18.1: Implement Logistic Regression for classification and evaluate model accuracy.	02	CO5
19.	**Construct and visualize a Decision Tree model** in Python for classification or regression tasks to interpret decision-making.	LLO 19.1: Construct and visualize a Decision Tree model for classification or regression tasks.	02	CO5
20.	**Apply the K-Nearest Neighbors (KNN) algorithm** in Python to classify data points based on nearest neighbors and majority voting.	LLO 20.1: Apply K-Nearest Neighbors (KNN) algorithm for classification using nearest neighbors.	02	CO5
21.	**Perform K-Means clustering** in Python to partition data into similar groups.	LLO 21.1: Perform K-Means clustering to group data into similar clusters.	02	CO6
22.	Implement the DBSCAN clustering algorithm using Python (Scikit-learn) to group data points based on density, identify core, boundary, and noise points, and visualize the clusters using a scatter plot.	LLO 22.1: Apply and implement the DBSCAN algorithm to cluster data, identify core, boundary, and noise points, and analyze clustering results using appropriate parameters.	02	CO6
23.	**Perform association rule mining using the Apriori algorithm to** identify frequent patterns in datasets.	LLO 23.1: Apply Apriori algorithm to find frequent itemsets	02	CO6
24.	**Implement Principal Component Analysis (PCA)**to reduce dimensionality while retaining significant variance in the data.	LLO 24.1: Apply PCA for dimensionality reduction	02	CO6

F) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF-LEARNING)) –

Self-Learning

- Prepare a report on different machine learning paradigms and tools (Supervised, Unsupervised, Reinforcement Learning, Python ML libraries).
- Study and document the basics of popular ML frameworks such as Scikit-learn, TensorFlow, and PyTorch (overview only).
- Implement simple ML programs using Python:
    1. Load and explore datasets (e.g., Iris, MNIST, or Titanic or any other dataset).
    2. Preprocess data (handle missing values, normalize/standardize features).
    3. Apply supervised learning algorithms (e.g., Linear Regression, Decision Trees, KNN) and evaluate performance.
    4. Apply unsupervised learning techniques (e.g., K-Means clustering, PCA).
    5. Visualize data and model results using Matplotlib/Seaborn.
- Implement file operations and data handling for datasets (read/write CSV, JSON).
- Complete any one course related to Machine Learning or AI on platforms like Coursera, Udemy, or Infosys Springboard.

Assignment

- Solve assignments covering all COs provided by the instructor:
    - Python basics for ML, data preprocessing, model training and evaluation, visualization, and performance metrics.

Mini / Micro Projects

- Develop a Student Performance Prediction System using ML algorithms (predict grades based on student data).
- Develop a Customer Segmentation System using clustering techniques (group customers based on purchasing behavior).
- Develop a Movie Recommendation System using ML algorithms.
- Develop a Simple Spam Email Classifier using supervised learning (classify emails as spam or not spam).

Free Online short courses related to machine learning on digital platforms like- Infosys Springboard /Swayam-Nptel/ TCS iON Digital Learning Hub / Kaggleetc as suggested by the course faculty.

Note:
Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
If a microproject is assigned, it is expected to be completed as a group activity.
SLA marks shall be awarded as per the continuous assessment record.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer System – High-performance computer with at least 16 GB RAM, multi-core CPU, SSD storage, and GPU support (e.g., NVIDIA CUDA-compatible) suitable for Machine Learning	All

	tasks	
2.	Machine Learning Development Environment – Python-based environment with libraries like TensorFlow, PyTorch, scikit-learn, Jupyter Notebook, and optionally MySQL for data storage	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to Machine Learning	7	3	4	3	10
2.	Introduction to data and its types	9	5	5	5	15
3.	Data pre-processing	7	3	4	3	10
4.	Feature Engineering	9	5	6	4	15
5.	Supervised Learning	7	3	4	3	10
6.	Unsupervised Learning	6	3	4	3	10
	Total	45	26	33	11	70

I) ASSESSMENT TOOL –

1) Formative assessment
    1) A continuous assessment-based term work
2) Summative Assessment
    - Lab performance, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
	Aurélien Géron	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	O'Reilly Media, ISBN: 978-1492032649
2.	Ian Goodfellow, Yoshua Bengio, Aaron Courville	Deep Learning	MIT Press, ISBN: 978-0262035613
3.	Yuxi Liu	Python machine learning by examples	Packt publication ISBN:978-178355-311-2
4.	Saikat Dutt,SubramanianChandramouli Amit Kumar Das	Machine Learning	Pearson ISBN978-93-530-6669-7, eISBN: 978-93-895-8813-2
5.	Tom M Mitchell	Machine Learning	McGraw Hill, First edition ISBN: 13: 978-0070428072
6.	Sebastian Raschka, Vahid Mirjalili	Python Machine Learning	Packt Publishing ISBN: 978-1800567703

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	https://scikit-learn.org/stable/tutorial/index.html
2.	https://www.geeksforgeeks.org/machine-learning/machine-learning/
3.	https://www.w3schools.in/machine-learning
4.	www.bookboon.com
5.	https://www.kaggle.com/learn/intro-to-machine-learning
6.	https://www.tutorialspoint.com/machine_learning/index.htm
Note: Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students.	

K) CO-PO-PSO Matrix –

Course Outcomes(COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO-1	PSO-2	PSO-3
CO1	3	2	-	-	-	-	-	-	1	-
CO2	3	3	2	3	-	-	1	-	2	-
CO3	3	3	-	2	-	-	-	-	1	-
CO4	3	3	-	2	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	2	1
CO6	3	3	-	2	-	-	-	-	1	1

Legends: - High: 03, Medium: 02, Low: 01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	AI Tools and Techniques
Course code	R23CP6406
Course Category	SEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
							FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	4	-	4	3	-	-	-	-	-	50	20	25@	10	-	-	75

Abbreviations:

CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

A) RATIONALE

AI tools and techniques provide learners with a structured pathway to understand artificial intelligence from its foundations to advanced applications. The syllabus begins with core concepts, history, and industry relevance, then moves into prompting strategies and language models like ChatGPT and Google Gemini for effective communication. It emphasizes workplace productivity through tools such as Perplexity AI, Grammarly, Microsoft Copilot, and Notion AI, while also introducing agentic AI and reasoning loops for autonomous task execution. Learners gain practical skills in data analytics with Power BI and explore automation workflows using Zapier and Power Automate, all while addressing ethical considerations. This ensures students can apply AI intelligently, productively, and responsibly across academic, professional, and industry contexts.

B) EXPECTED SKILL/s –

AI tools and techniques help learners develop skills in prompting, research, writing assistance, workplace productivity, agentic AI, data analytics, automation workflows, and ethical AI use for effective and responsible real-world applications.

C) COURSE OUTCOMES (COs) –

Students will be able to

1. Explain AI concepts, history, types, applications, and the role of AI tools.
2. Apply prompting techniques using ChatGPT, Gemini, and other language AI tools responsibly.
3. Use AI tools for research, writing, documentation, and multimedia content creation.
4. Demonstrate how AI agents work with goals, memory, tools, and reasoning loops.
5. Build interactive dashboards by applying data ingestion, preprocessing, modeling, and visualization in Power BI.
6. Design AI workflows with no-code automation tools while addressing ethical and responsible AI practices.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
1.	**Introduction to AI & AI Tools** **1.1** Introduction to Artificial Intelligence **1.2** History & Evolution of AI **1.3** Types of AI: ANI, AGI, ASI **1.4** Applications of AI in Industry **1.5** Overview of AI Tools – Need & Benefits	**TLO 1.1:** Define AI and explain its evolution. **TLO 1.2**: Differentiate between ANI, AGI, and ASI. **TLO 1.3:** Identify AI applications in industry. **TLO 1.4:** Classify AI tools based on functionality and benefits.	**4**	**-**	**CO1**
2.	Prompting& Language AI Tools **2.1** Prompt mindset and fundamentals **2.2** Prompting techniques: Zero-shot, Few-shot, Role-based **2.3** Ethical and responsible AI use **2.4** ChatGPT & OpenAI GPT models: use cases in coding, content, research **2.5** Google Gemini for research and writing	**TLO 2.1:** Understand prompt mindset and fundamentals. **TLO 2.2:** Apply zero-shot, few-shot, and role-based prompting techniques. **TLO 2.3:** Use ChatGPT and Google Gemini for content, coding, and research. **TLO 2.4:** Demonstrate ethical and responsible use of language AI tools.	**4**	**-**	**CO2**
3.	**AI-Augmented Research & Workplace Productivity** **3.1** Perplexity AI for research and summarization **3.2** Grammarly &QuillBot for writing assistance **3.3** Microsoft Copilot (Word, Excel, PowerPoint, Teams) **3.4** Google Copilot (Gemini for Gmail, Docs, Sheets, Slides) **3.5** Notion AI for documentation and planning	**TLO 3.1:** Use AI tools to summarize research papers and web content. **TLO 3.2:** Improve writing quality using Grammarly & QuillBot. **TLO 3.3:** Automate document creation and data analysis with Microsoft/Google Copilot. **TLO 3.4:** Manage project documentation using Notion AI. **TLO 3.5:** Create basic	**5**	**-**	**CO3**

	3.6 Introduction to Generative AI: Canva Magic Media, Adobe Firefly (Text, Image, Audio)	generative AI content for text, images, and audio.			
4.	**Agentic AI & Personal AI Assistants** **4.1** Introduction to Agentic AI **4.2** AI Tools vs AI Agents **4.3** Working of AI Agents – Goals, memory, tools, and actions **4.4** Reasoning loop (Observe–Think–Act)	**TLO 4.1:** Define agentic AI and differentiate from standard AI tools. **TLO 4.2:** Explain the working of AI agents including goals, memory, tools, and actions. **TLO 4.3:** Apply the reasoning loop (Observe–Think–Act) concept.	**5**	**-**	**CO4**
5.	**AI Data Analytics with Power BI** **5.1** Introduction to Business Intelligence (Power BI Desktop, Service, Mobile); Role of AI vs Excel; Industry use cases **5.2** Data Ingestion – Excel, CSV, Web URLs, SQL; Cloud vs Local Data **5.3** Data Preprocessing (Power Query) – Cleaning, Transformations, M-Language overview **5.4** Data Modeling & Logic – Table Relationships (Star Schema), DAX metrics **5.5** Visualization & Visual Storytelling – Bar, Line, Donut, KPI Cards, Geospatial Maps, Slicers & Filters.	**TLO 5.1:** Extract and connect data from multiple sources using Power BI. **TLO 5.2:** Clean and preprocess data for analysis using Power Query. **TLO 5.3:** Build data models and calculate business metrics using DAX. **TLO 5.4:** Design interactive dashboards and visual storytelling. **TLO 5.5:** Leverage AI features for automated insights (Smart Narratives, Q&A).	**7**	**-**	**CO5**
6.	**AI Automation, Ethics & Applications** **6.1** AI Automation Concepts – Triggers, actions, workflows **6.2** No-Code Automation Tools – Zapier, Make, Power Automate, connecting apps **6.3** Ethical & Responsible AI – Bias, privacy, HITL, ethical considerations **6.4** Multi-Step AI Workflows – Conditional logic, loops, error handling, examples	**TLO 6.1:** Explain AI automation concepts including triggers, actions, and workflows. **TLO 6.2:** Use no-code platforms to automate tasks across multiple apps. **TLO 6.3:** Apply ethical and privacy principles in AI automation. **TLO 6.4:** Design multi-step AI workflows with conditional logic and error handling.	**5**	**-**	**CO6**

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Study real-world applications of AI in industry, education, and business.	**LLO 1.1:** Identify and analyze real-world applications of Artificial Intelligence across industries such as healthcare, finance, education, and business. **LLO 1.2:** Evaluate how AI technologies improve efficiency, decision-making, and automation in modern organizations.	**2**	**CO1**

2.	Identify and differentiate between ANI, AGI, and ASI with examples.	**LLO 2.1:** Explain the differences between Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI). **LLO 2.2:** Illustrate practical and theoretical examples to demonstrate the capabilities and limitations of each AI type.	**2**	**CO1**
3.	Design a zero-shot prompt to generate a professional email without providing examples.	**LLO 3.1:** Design effective zero-shot prompts to generate professional content without providing examples. **LLO 3.2:** Evaluate the accuracy and relevance of AI-generated responses using zero-shot prompting techniques.	**2**	**CO2**
4.	Create a few-shot prompt to generate consistent product descriptions for an e-commerce site.	**LLO 4.1:** Develop few-shot prompts that guide AI models to generate consistent and structured product descriptions. **LLO 4.2:** Assess how example-based prompting improves output consistency and quality.	**2**	**CO2**
5.	Use role-based prompting to simulate a teacher explaining AI ethics to beginners.	**LLO 5.1:** Apply role-based prompting techniques to guide AI responses according to a specific persona or expertise. **LLO 5.2:** Generate simplified explanations of complex AI concepts suitable for beginner-level audiences.	**2**	**CO2**
6.	Modify a prompt to eliminate bias and generate responsible AI responses.	**LLO 6.1:** Identify potential bias in AI prompts and outputs. **LLO 6.2:** Modify prompts to produce ethical, unbiased, and responsible AI-generated responses.	**2**	**CO2**
7.	Debug a Python program using AI-assisted code suggestions.	**LLO 7.1:** Utilize AI-assisted tools to identify and fix errors in Python programs. **LLO 7.2:** Improve code efficiency and correctness using AI-generated debugging suggestions.	**2**	**CO2**
8.	Build a simple To-Do web app with add, delete, and local storage using Cursor AI.	**LLO 8.1:** Develop a basic web application with add, delete, and local storage functionality. **LLO 8.2:** Use AI-powered development tools such as Cursor AI to accelerate coding and debugging.	**2**	**CO2**
9.	Research and summarize future trends in Agentic AI with references.	**LLO 9.1:** Conduct research on emerging developments and trends in Agentic AI. **LLO 9.2:** Produce structured summaries supported by credible references.	**2**	**CO2**
10.	Generate a research summary with citations on AI in education.	**LLO 10.1:** Use AI tools to generate structured research summaries on AI	**2**	**CO3**

		applications in education. **LLO 10.2:** Incorporate academic citations and references to support research findings.		
11.	Build a script that summarizes long text using the GPT API free tier.	**LLO 11.1:** Implement a Python script that uses the GPT API to summarize large text documents. **LLO 11.2:** Evaluate the effectiveness of AI-generated summaries for clarity and information retention..	**2**	**CO3**
12.	Analyze a sales dataset in excel using natural language prompts.	**LLO 12.1:** Apply natural language prompts to analyze datasets in Excel. **LLO 12.2:** Identify patterns, trends, and key insights from sales data using AI-assisted analysis.	**2**	**CO3**
13.	Create an AI generated project plan with mile stone and task breakdown.	**LLO 13.1:** Generate structured project plans using AI tools including milestones and task breakdown structures. **LLO 13.2:** Evaluate the practicality and feasibility of AI-generated project schedules.	**2**	
14.	Design and implement a **text-to-image and text-to-video generation task** using **Canva Magic Media** and **Grok**	**LLO 14.1:** Use generative AI tools such as Canva Magic Media and Grok to create visual media assets. **LLO 14.2:** Apply descriptive prompting techniques to control style, composition, and visual storytelling.	**2**	**CO3**
15.	Develop a basic note application with create, edit and delete features.	**LLO 15.1:** Design a simple application with create, edit, and delete functionality. **LLO 15.2:** Test and evaluate the usability and functionality of the developed application.	**2**	**CO3**
16.	Develop a simple autonomous content curator agent that suggests articles or topics based on user interests (simulated dataset).	**LLO 16.1:** Design a basic AI agent that recommends content based on user interests. **LLO 16.2:** Evaluate recommendation accuracy using simulated datasets.	**2**	**CO4**
17.	Create a multi-step AI research agent that collects topic input, breaks it into subtopics, and generates a structured outline.	**LLO 17.1:** Develop an AI agent that processes topic inputs and generates structured subtopics. **LLO 17.2:** Organize research outputs into a logical outline for structured knowledge generation.	**2**	**CO4**
18.	Import data from Excel/CSV/Web into Power BI and perform basic exploration.	**LLO 18.1:** Import datasets from Excel, CSV, and web sources into Power BI. **LLO 18.2:** Conduct basic exploratory analysis to identify patterns and anomalies in the data..	**2**	**CO5**
19.	Clean and transform data using Power Query (filtering, column split, data types).	**LLO 19.1:** Apply Power Query transformations such as filtering, splitting columns, and adjusting data types.	**2**	**CO5**

		LLO 19.2: Prepare clean and structured datasets suitable for business analysis.		
20.	Create a data model using relationships (Star Schema) and write simple DAX measures.	**LLO 20.1:** Design efficient data models using relationships and Star Schema structures. **LLO 20.2:** Develop DAX measures to perform calculations and support analytical reporting.	**2**	**CO5**
21.	Build an interactive Power BI dashboard using charts, slicers, and KPI cards.	**LLO 21.1:** Design interactive dashboards that effectively communicate insights and business performance. **LLO 21.2:** Apply KPI visualizations and evaluate dashboard usability for stakeholders.	**2**	**CO5**
22.	Design a no-code automation workflow using Zapier / Power Automate for a business scenario.	**LLO 22.1:** Create no-code automation workflows using tools like Zapier or Power Automate. **LLO 22.2:** Integrate multiple services and evaluate the efficiency improvements of automated workflows.	**2**	**CO5**
23.	Create a multi-step AI workflow with conditions, loops, and error handling.	**LLO 23.1:** Design multi-step AI workflows using conditional logic and automation steps. **LLO 23.2:** Implement error-handling mechanisms to ensure reliable AI workflow execution.	**2**	**CO5**
24.	Analyze an AI system for ethical risks (bias, privacy, HITL) and propose mitigation strategies.	**LLO 24.1:** Identify ethical risks in AI systems such as bias, privacy concerns, and lack of transparency. **LLO 24.2:** Propose mitigation strategies including technical safeguards and Human-in-the-Loop oversight.	**2**	**CO6**
25.	Generate an AI-based project plan with milestones, task breakdowns, and timelines.	**LLO 24.1:** Generate structured project plans with detailed task breakdowns and milestones. **LLO 24.2:** Develop realistic project timelines and evaluate their feasibility.	**2**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Self-Learning-

-

Assignment-

-

Micro project-

Note:

- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer system - (Any computer system with basic configuration)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

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I) ASSESMENT TOOL –

1) Formative assessment

1) Continuous assessment based on process and product related performance indicators
2) Each practical will be assessed considering 60% weightage to process and 40% weightage to product
3) A continuous assessment-based term work

2) Summative Assessment

1) Lab performance, Viva voce.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1.	Rajalingappa Shanmugamani	Hands-On Artificial Intelligence with Python	Packt Publishing, ISBN: 978-1788993093
2.	Bernard Marr	Artificial Intelligence in Practice	Wiley, ISBN: 978-1119542280
3.	Kai-Fu Lee	AI Superpowers	Houghton Mifflin Harcourt, ISBN: 978-1328546395

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	OpenAI Documentation – https://platform.openai.com/docs
2.	Google AI & Gemin - https://ai.google
3.	Microsoft Azure AI - https://learn.microsoft.com/azure/ai-services
4.	AWS Machine Learning –https://aws.amazon.com/machine-learning
5.	Perplexity AI – https://www.perplexity.ai
6.	OpenAI Documentation – https://platform.openai.com/docs

Note:

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

K) CO-PO-PSO Matrix –

COURSE OUTCOME	Program Outcomes							Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	2	-	1	1
CO2	3	2	2	-	3	-	2	-	2	2
CO3	3	2	2	3	2	2	2	-	3	2
CO4	3	2	2	2	2	-	2	2	2	2
CO5	3	3	3	3	-	2	2	2	3	2
CO6	3	2	2	2	3	2	3	-	2	2

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer
Course Name	Software Testing Tools and Automation
Course code	R23CP6407
Course Category	SEC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	2	-	4		-	-	-	-	-	50	20	-	-	-	-	50

Abbreviations:

CL- Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment.
Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination.

A) RATIONALE

Software testing ensures the quality and reliability of software systems. With increasing complexity, automation has become essential alongside manual testing. This course provides fundamental knowledge of testing and hands-on experience with tools like Selenium Web-Driver and Tricentis Tosca. It also covers frameworks, POM, and data-driven testing, helping students develop practical skills and become industry-ready in software testing and automation.

B) EXPECTED SKILLS/s-

1) Automate web applications using Selenium Web-Driver (Java).
2) Design reusable and maintainable test cases using POM (Selenium) and TCD (Tosca).
3) Perform test execution, data-driven testing, and analyse results with reporting tools.

C) COURSE OUTCOMES (COs) -

1. Demonstrate understanding of software testing fundamentals and configure Selenium automation environment.
2. Apply Selenium Web-Driver basics to automate browser actions and interact with web elements using locators.

3. Implement advanced Selenium features including synchronization, alerts, frames, navigation, and TestNG framework.
4. Design and execute automation framework using POM, data-driven testing, reporting, and cross-browser testing.
5. Understand Tosca architecture and design reusable, maintainable test cases using TCD concepts.
6. Execute Tosca test cases with test data management, recovery scenarios, configuration, and reporting for result analysis.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	TLOs (Terminal Learning Outcomes)	CL Hrs./ Week	FA-TH MAX	CO Mapped
1	**Introduction To Fundamentals of Software Testing and Selenium Automation:** Introduction to Testing Fundamentals; Manual vs Automation Testing; Types of testing and need of automation testing;-Test Case Development Java installation & IDE setup (Eclipse / IntelliJ); Selenium Web-Driver setup with Java.	**TLO1.1:** Explain fundamentals of software testing and differentiate manual vs automation. **TLO1.2:** Set up Java, IDE, and Selenium Web-Driver environment. **TLO1.3:** Execute a simple Selenium test to validate setup.	**4**	-	**CO1**
2	**Selenium Web-Driver:** Basics Selenium Web-Driver Introduction; Browser drivers (Chrome-Driver, Gecko-Driver); Web-Driver interface & browser commands; Locators in Selenium (ID, Name, Class Name, XPath, CSS Selectors); Web-Element interface	**TLO2.1:** Demonstrate launching browsers and using Web-Driver commands. **TLO2.2:** Apply locators to identify and interact with web elements. **TLO2.3:** Automate form interactions using Web-Element methods.	**5**	-	**CO2**
3	Advanced Selenium Automation — Handling Web Elements (Radio buttons, checkboxes, dropdowns); Synchronization (Implicit Wait, Explicit Wait); Handling Alerts, Frames & Windows; Navigation commands; Introduction to Test-NG framework (Annotations, Execution flow)	**TLO3.1:** Automate handling of web elements, alerts, frames, and navigation. **TLO3.2:** Implement synchronization using implicit and explicit waits. **TLO3.3:** Apply Test-NG annotations and execute structured test cases.	**6**	-	**CO3**
4	**Selenium Framework Basics & Mini Project:** Test Automation Framework concepts; Page Object Model (POM); Data-driven testing (Excel/Properties file – intro); Test reporting basics; Cross-browser testing overview	**TLO4.1:** Explain framework concepts and implement Page Object Model. **TLO4.2:** Apply data-driven testing and generate reports. **TLO4.3:** Perform cross-browser testing to validate compatibility.	**5**	-	**CO4**
5	**Introduction to TOSCA & Test Case Design:** Introduction to Tricentis Tosca; Model-Based Test Automation; Tosca Architecture & Components; Tosca Workspace & Modules; Test	**TLO5.1:** Describe Tosca architecture, components, and model-based automation. **TLO5.2:** Create Tosca modules and design test cases using TCD concepts. **TLO5.3:** Implement reusable and	**6**	-	**CO5**

	Case Design (TCD) concepts; Implement reusable and maintainable test cases in Tosca.	maintainable test cases in Tosca.			
6	**Tosca Automation & Execution:** Test Case Execution in Tosca; Test Data Management; Recovery Scenarios; Test Configuration Parameters; Reporting & Results Analysis	**TLO6.1:** Execute Tosca test cases with test data management. **TLO6.2:** Handle recovery scenarios and configure execution parameters. **TLO6.3:** Generate reports and analyse results for defect identification.	**4**	**-**	**CO6**

E) PRACTICAL (BASED ON LLO& TLO) ASSESSMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1	To perform manual testing of Login functionality of a web application.	LLO1.1: Understand the steps involved in manually testing a login page. LLO1.2: Identify common issues like invalid inputs and error messages during login testing.	**2**	**CO1**
2	*Environment Setup for Java Selenium Automation.	LLO2.1: Learn how to install and configure Java, Selenium, and IDE tools. LLO2.2: Verify the setup by running a simple Selenium test.	**2**	**CO1**
3	Launch Browser and Open Website.	LLO3.1: Write a basic Selenium script to launch a browser. LLO3.2: Open a specific website and confirm successful navigation.	**2**	**CO2**
4	*Login Page Automation: Positive and Negative Test Scenarios.	LLO4.1: Automate entering username and password using Selenium. LLO4.2: Validate successful login by checking page redirection or welcome message.	**2**	**CO2**
5	Automation of Login Functionality Using Selenium Locators.	LLO5.1: Learn different Selenium locators (ID, Name, XPath, CSS). LLO5.2: Apply locators to automate login functionality effectively.	**2**	**CO2**
6	*Implementation of Selenium Web-Driver Commands.	LLO6.1: Explore basic Web-Driver commands like get(), navigate(), close(). LLO6.2: Use commands to control browser actions in automation scripts.	**2**	**CO2**
7	Implementation of Selenium Web-Element Commands.	LLO7.1: Learn Web-Element methods like click(), sendKeys(), getText(). LLO7.2: Apply these methods to interact with form fields and buttons.	**2**	**CO2**

8	*Handling JavaScript Alerts Using Selenium Web-Driver.	LLO8.1: Understand how to detect and switch to JavaScript alerts. LLO8.2: Perform actions like accept, dismiss, and read alert text.	**2**	**CO3**
9	Handling Dropdown Elements Using Selenium Web-Driver.	LLO9.1: Learn how to select options from dropdown menus. LLO9.2: Use different selection methods (by index, value, visible text).	**2**	**CO3**
10	Implementation of Wait Handling in Selenium Web-Driver.	LLO11.1: Understand implicit and explicit waits in Selenium. LLO11.2: Apply waits to handle dynamic page loading.	**2**	**CO3**
11	*Handling Frames Using Selenium Web-Driver.	LLO12.1: Learn how to switch between frames in a webpage. LLO12.2: Automate actions inside frames and return to main content.	**2**	**CO3**
12	*Capturing Screenshots in Selenium Web-Driver.	LLO13.1: Use Selenium commands to capture screenshots. LLO13.2: Save screenshots for debugging and reporting purposes.	**2**	**CO4**
13	*Implementation of Page Object Model (POM) in Selenium Automation Framework.	LLO14.1: Understand the concept of Page Object Model (POM). LLO14.2: Implement POM to improve test case readability and reusability.	**2**	**CO4**
14	*Study and Implementation of TestNG Framework with Annotations and Test Execution Flow.	LLO15.1: Learn TestNG annotations like @Test, @BeforeTest, @AfterTest. LLO15.2: Execute test cases using TestNG and view structured reports.	**2**	**CO4**
15	*Test Reporting and Cross-Browser Automation Testing Using Selenium	LLO16.1: Generate test execution reports using Selenium and TestNG. LLO16.2: Perform automation testing across different browsers.	**2**	**CO4**
16	*Study of Tricentis Tosca Architecture, Workspace, and Core Components.	LLO17.1: Understand Tosca's architecture, workspace, and components. LLO17.2: Explore Tosca's model-based test automation approach.	**2**	**CO5**
17	*Creation of Tosca Modules and Test Case Design Using TCD Concepts.	LLO18.1: Learn how to create Tosca modules for automation. LLO18.2: Design test cases using Tosca Test Case Design (TCD) concepts.	**2**	**CO5**
18	*Implementation of Reusable and Maintainable Test Cases in Tosca.	LLO19.1: Create reusable test cases to reduce duplication.	**2**	**CO5**

		LLO19.2: Apply best practices for maintainable Tosca test cases.		
19	*Execution of Automated Test Cases with Test Data Management and Recovery Scenarios.	LLO20.1: Execute automated test cases with different test data sets. LLO20.2: Handle recovery scenarios during test execution.	**2**	**CO6**
20	*Test Configuration, Execution Reporting, and Result Analysis in Tosca.	LLO21.1: Configure test execution settings in Tosca. LLO21.2: Generate reports and analyse test results for improvements.	**2**	**CO6**

F) SELF LEARNING ASSESSMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Self-Learning

- Complete the Software Testing Course Tricentis Academy Platform.

Assignment

-

Micro project

-

Note:

- Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a micro project is assigned, it is expected to be completed as a group activity.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system - (Any computer system with basic configuration)	All
2	Automation Tool Selenium Web-driver , Eclipse, Tosca Commander	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

I) ASSESSMENT TOOL –

3) **Formative assessment**
   4) Continuous assessment based on process and product related performance indicators.
   5) Each practical will be assessed considering 60% weightage to process and 40% weightage to product.
   6) A continuous assessment-based term work.
4) **Summative Assessment**

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	UnmeshGundecha	Selenium Testing Tools Cookbook	978-1784392512
2	Mark Fewster, Dorothy Graham	*Software Test Automation: Effective Use of Test Execution Tools*	978-0201331400
3	Alan Richardson	*Selenium Simplified: Selenium-RC, Java & JUnit.*	978-1494768867
4	Alan Richardson	*Java for Testers*	978-0956733290

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	https://archive.org/details/seleniumtestingt0000gund https://www.slideshare.net/slideshow/gundecha-u-selenium-testing-tools-cookbook-2012pdf/262816461
2.	https://www.researchgate.net/publication/384145162 https://dl.acm.org/doi/book/10.5555/312384
3.	https://seleniumsimplified.com
4.	https://www.eviltester.com/page/books/
5.	https://www.scribd.com/document/95970179/Automated-Software-Testing
6.	https://content.e-bookshelf.de/media/reading/L-13663025-7e70f7abde.pdf

Note:
K) Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students.

K) CO-PO –PSOs Matrix –

Course Outcome	Program Outcomes							Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO 2**	**PSO 3**
CO1	3	2	1	–	1	–	–	–	1	–
CO2	3	2	2	1	2	–	–	–	2	1
CO3	2	2	2	2	2	–	–	–	2	1
CO4	2	2	3	2	2	–	1	–	2	2
CO5	1	1	2	2	2	–	–	–	2	1
CO6	1	1	2	3	2	–	1	–	2	2

Legends: - High: 03, Medium: 02, Low: 01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Capstone Project
Course code	R23CP5402
Course Category	INP
Credits	2

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme												
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	2	2	4	2	-	-	-	-	-	50	20	50#	20	50	20	150

A) RATIONALE

Capstone projects are an essential part of diploma studies in computer engineering as they allow students to integrate and apply the knowledge gained throughout their coursework to real-world problems. They provide practical exposure to industry practices, enhance problem-solving skills, and strengthen professional readiness. By working on projects that often involve collaboration with companies or organizations, students gain valuable insights into workplace culture, teamwork, and technical applications. This experience prepares them for employment, higher education, and lifelong learning in the rapidly evolving field of computer engineering.

B) EXPECTED SKILLS

The goal of this course is to help students learn what they need to know to do in their jobs. The school wants students to be able to do the following things:

• Use what they have learned to solve problems make plans and show what they can do.

C) COURSE LEVEL LEARNING OUTCOMES (COS)

When students finish this course they should be able to do the following things:

CO1: Identify and define computer engineering problems suitable for capstone projects.

CO2: Assess feasibility through data collection, experimentation, coding, and analysis.

CO3: Apply computer engineering knowledge and tools to design and implement solutions.

CO4: Present project outcomes effectively through reports, demonstrations, and oral presentations.

D) General guidelines for PROJECT WORK

The Project- problems must be related to the programmed or may be interdisciplinary, based on the industry expected outcomes.

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work they would like to execute.

Project titles are to be finalized in co-ordination/consultation with the Faculty mentor. However, faculty may form a team of students as per specific roles- Literature survey/data collection, data Analysts,

model/prototype developers, testers, Project managers using IoTs ITES and software /application development. Study type project is NOT advisable.

Project must be assigned to a group of 3-4 students under the guidance of identified faculty mentor.

Students are required to prepare a prototype/working model/software of the Project and simultaneously prepare a report.

Students shall Submit One Hard copy and one Soft copy each of Project Report and soft-copy of the project code or the working model.

Students must maintain a project execution diary having the progress steps and details. The concerned faculty should check the diary on a weekly basis and accordingly interact with students based on the progress shown and keep proper record with feedback if any.

Project shall address National Thrust area such as Environment, Digitization, Automation, sustainability and similar domains.

Student shall try to use the national and international standards wherever possible (processes / materials / equipments etc ..)

V. Project facilitation guidelines:

Once the Project statement has been finalized and allotted to the students, the Faculty Mentor role is very important as guide, motivator, catalyser to promote learning and sustain the interest of the students. At the same time the Faculty Mentor is not expected to guide the students on each step, otherwise it will curb the creativity of the students-group. The Faculty Mentor has to work as a mentor. Following should be kept in mind while facilitating the project at the institute:

1. **Project orientation cum -briefing:** the project should be relevant to the curriculum of the programme. The project shall be cost effective taking safety aspects, ethical issues, environmental issues and confidentiality as per expectation of industry(if any) into consideration, The work may be industry Sponsored.
2. **Information search and data collection**: the information and data should be realistic and relevant to the problem /project. Hypothetical data is not to be taken into consideration.
3. **Implementation and Monitoring:** The project must have important steps /milestones to achieve as per the time frame/action plan prepared by students and faculty. The monitoring mechanism such as daily/weekly dairy (**Format given below)** must be clearly explained and delineated for the students.

VI. Criteria of Assessment/Evaluation of Project work

A. Formative Assessment(FA)criteria

The **Formative Assessment** (FA) of the students for 50 marks is to be done based on following criteria. **Appropriate RUBRICS may be used for assessment Rubrics for Assessment of the team**

Sr. No.	Criteria	Marks
1	Project Selection & Problem definition	05
2	Literature survey and data collection/ Gathering	05
3	Design/concept of project/Working-Executionof Project	10
4	Stage wise progress as per Action plan/milestone	05
5	Quality Report Writing	05

Rubrics for Individual Assessment

Sr. No.	Criteria	Marks
1	Contribution as a team member	05
2	Depth of Knowledge	10
3	Presentation	05

B. Summative Assessment Criteria

The summative assessment for 50 marks is to be done and based on following criteria. This assessment shall be done by the faculty mentor and External examiner.

Sr. No.	Criteria	Marks
1	Capstone Project Completion as per plan	10
2	Project related Requirement Analysis &Designing	10
3	Developing a Solution with proper justifications, Teamwork	10
4	Project Report Writing	10
5	Project Presentation	10

NOTE : Team based and Individual performance based summative assessment may include Innovativeness , Technology used , user friendliness ,cost effectiveness, society benefits etc..

SUGGESTEDRUBRICFORSUMMATIVEASSESSMENTOFCAPSTONEPROJECT

PROJECTASSESSMENT				
Project Title:				
Project Assessment Rubric				
Performance	Excellent	Good	Fair	Poor
Criteria	9-10 marks.	6-8 marks.	4-5 marks.	0-3 marks
	Excellent	Good	Fair	Poor
Capstone Project Completion	The project is completed as per tasks described in Synopsis.	The project is completed but require minor Modifications.	The project is completed but require several Modifications.	The project is not completed as per tasks described in Synopsis.

Project related Requirement Analysis & Designing	9-10 marks.	6-8 marks.	4-5 marks.	0-3 marks
	Effectively contributed in requirement Analysis and designing.	Partially Contributed in requirement Analysis and designing.	Attempted to contribute in requirement analysis and designing	No contribution in requirement analysis and designing.
Developing a Solution with proper justifications , Teamwork	9-10 marks.	6-8 marks.	4-5 marks.	0-3 marks
	Developed the critical solution modules with Innovation, optimized design and worked very well with the team.	Developed some solutions with Higher complexity and worked well with the team.	Attempted to develop few solutions and Worked with the team.	No contribution in developing a solution and in the team.
Project Report Writing	9-10 marks.	6-8 marks.	4-5 marks.	0-3 marks
	Worked very well to submit an excellent project report .	Worked well to submit the project report with covering all the aspects of a standard report.	Tried to submit the project report but standard of report was not satisfactory.	No contribution in project report writing.
Project Presentation	9-10 marks.	6-8 marks.	4-5 marks.	0-3 marks
	Presented the project work flawlessly.	Presented the Project work very nice.	Presented the Project work not so well.	Presentation skill is not up to the mark.
Project Group Members				
ROLL NUMBER/Enrollment Number				
NAME				
Comments (if any)				

NOTE: "These are suggestive rubrics Faculty mentor and external examiner may frame different rubrics as per Programmed need and assigned Project work "

C. Self Learning Assessment

Self Learning Assessment **Max Marks -50**

Sr. No.	Criteria	Max Marks	Marks Obtained
1	Project Selection & Problem definition	10	
2	Literature survey and data collection/ Gathering	05	
3	Design/concept of project/Working-Executionof Project	15	
4	Stage wise progress as per Action plan/milestone/ psychomotor motor skills acquired	10	
5	Quality Report Writing	10	

VII. Typographical instructions/guidelines for Project report writing

Following is the suggestive format for preparing the Project report. Actual report may differ slightly depending upon the nature of industry. The training report may contain the following.

a. The PROJECT report shall be computer typed (English- British) and printed onA4 size paper.
b. Text Font-Times New Roman(TNR),Size-12point
c. Subsection heading TNR- 12 point bold normal
d. Section heading TNR- 12 capital bold
e. Chapter Name/TopicName–TNR-14 Capital
f. All text should be justified. (Settings in the Paragraph)
g. The report must be typed on one side only with double space with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.
h. The training report must be hardbound/ Spiral bound with cover page in black colour. The name of the candidate, diploma (department), year of submission, name of the institute shall be printed on the cover [Refer sample sheet (outer cover)]
i. The training report, the title page [Refer sample sheet (inner cover)] should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.

VIII. Project Report

On completion of the project work, every student will submit a project report which should contain the following:

1. Cover Page (as per annexure 1)
2. Title page(asperannexure2)
3. Certificate by the Guide(as per annexure 3)
4. Acknowledgment (The candidate may thank all those who helped in the execution of the project.)
5. Abstract (It should be in one page and include the purpose of the study; the methodology used.)
6. Table of Contents (as per general guidelines): Detailed description of the project (This should be split in various chapters/sections with each chapter/section describing a project activity in totality).

Chapter–1 Introduction (background of the Industry or User based Problem/Task) Chapter–2 Literature Survey (to finalize and define the Problem Statement) Chapter–3 Scope of the project

Chapter–4 Methodology/Approach, if any
Chapter-5 Details of designs, working and processes Chapter-6 Results and Applications

7. Conclusion
8. References (The listing of references should be typed 2 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. It should be numbered consecutively (in square [ ] brackets, throughout the text and should be collected together in the reference list at the end of the report. The references should be numbered in the order they are used in the text. The name of the author/authors should

Be immediately followed by them do the details).Typical examples of the references are given below:

NOTE:

1. Project report must contain only a relevant and short mention – technology or platform or tools used. It must be more focused on project work and its implementation
2. Students can add/remove/edit chapter names as per the discussion with their guide

K) **CO-PO-PSO Matrix –**

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

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Network and Information Security
Course Code	R23CP3404
Course Category	DSE
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	0	4	-	6	4	3	30	70	100	40	25	10	25#	10	25	10	175

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

In modern digital systems, information is constantly stored, processed, and transmitted through computer networks, cloud platforms, mobile devices, and enterprise systems. This growing connectivity has increased the risk of cyber threats such as unauthorized access, malware attacks, data leakage, identity theft, password attacks, network intrusion, and database exploitation. Therefore, students of Computer Engineering need a strong foundation in information security concepts, authentication mechanisms, cryptographic techniques, firewall configuration, network protection, and database security. This course enables students to understand common cyber threats and apply suitable security measures to protect systems, applications, and information assets. It also develops practical skills required to implement basic security policies, access control methods, encryption techniques, and secure communication practices in real-world computing environments.

B) EXPECTED SKILL/s –

After completing this course, the student will be able to identify different cyber threats, malware types, and information security risks, apply authentication and access control mechanisms for securing users and resources, use cryptographic techniques for data protection and secure communication, configure firewalls and implement network security measures, apply security practices for e-mail, database, and cloud environments, and use appropriate tools and techniques to improve the security of computer systems and information assets.

C) COURSE OUTCOMES (COs)

At the end of the course, students will be able to:

1. Explain basic information security concepts.
2. Apply user authentication and access control.
3. Use classical cryptography techniques.
4. Apply modern encryption and digital security methods.
5. Implement network and e-mail security measures.
6. Apply database and cloud security techniques.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs	FA-TH Max	CO Mapped
1	Fundamentals of Computer and Information Security 1.1 Foundations of computer security: meaning, need and goals of information security 1.2 Security principles: confidentiality, integrity, availability, accountability, authentication, non-repudiation and reliability 1.3 Importance of information security and criteria for information classification 1.4 Types of attacks: active and passive attacks, masquerade attack, denial of service, spoofing, sniffing, phishing, replay attack, man-in-the-middle attack, TCP/IP hacking and social engineering 1.5 Types of malware: virus, worms, Trojan horse, spyware, adware, ransomware, logic bombs, rootkits and keyloggers 1.6 Threats, vulnerabilities, risks and role of operating system updates, patches and service packs	UO1.1 Explain the need and goals of information security. UO1.2 Describe major security principles and information classification. UO1.3 Identify common attacks and malware threats. UO1.4 Explain the relationship between threats, vulnerabilities and risks.	**8**	**12**	**CO1**
2	User Authentication and Access Control 2.1 Identification and authentication methods: electronic user authentication, username-password method, token-based authentication and multi-factor authentication 2.2 Password attacks: guessing, piggybacking, shoulder surfing and dumpster diving 2.3 Biometrics: fingerprint, handprint, retina scan, voice pattern, face recognition, signature and keystroke patterns 2.4 Authorization: introduction, goals and need of	UO2.1 Explain different user authentication methods. UO2.2 Identify password threats and biometric authentication methods. UO2.3 Explain authorization and access control principles. UO2.4 Compare DAC, MAC, RBAC and ABAC models.	**7**	**12**	**CO2**

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs	FA-TH Max	CO Mapped
	authorization 2.5 Access control concepts: access rights, permissions and control policies 2.6 Access control models: DAC, MAC, RBAC and ABAC				
3	Classical Cryptography and Secure Communication 3.1 Introduction to cryptography: plain text, cipher text, encryption, decryption, cryptanalysis and cryptology 3.2 Symmetric and asymmetric cryptography: concept, working and key management overview 3.3 Substitution techniques: Caesar cipher, Playfair cipher, Vigenere cipher and Vernam cipher 3.4 Transposition techniques: Rail fence cipher and simple columnar transposition 3.5 Overview of steganography and secure message hiding 3.6 Use of cryptography for secure communication and data protection	UO3.1 Explain the basics of cryptography and secure communication. UO3.2 Compare symmetric and asymmetric cryptography. UO3.3 Apply substitution and transposition techniques on text data. UO3.4 Explain the role of steganography in secure communication.	**8**	**12**	**CO3**
4	Modern Encryption and Digital Security 4.1 Need and working of firewall, packet filters, stateful packet filters, application gateways and circuit gateways 4.2 Firewall policies, basic configuration, limitations and demilitarized zone (DMZ) 4.3 DES, AES and RSA algorithms: purpose and comparison 4.4 Diffie–Hellman key exchange algorithm and man-in-the-middle attack 4.5 Hash functions: introduction, features and applications of MD5 and SHA 4.6 Digital signature and digital certificate: concept, working and applications	UO4.1 Explain firewall types, policies and DMZ concepts. UO4.2 Compare DES, AES and RSA algorithms. UO4.3 Explain Diffie–Hellman and hash functions. UO4.4 Describe digital signatures and digital certificates.	**7**	**10**	**CO4**
5	Network and E-mail Security 5.1 Intrusion Detection System (IDS): network-based IDS, host-based IDS and honeypots 5.2 Kerberos: working, Authentication Server (AS), Ticket Granting Service (TGS) and Service Server (SS) 5.3 IP security overview: Authentication Header	UO5.1 Explain IDS types and their role in network security. UO5.2 Describe Kerberos and IP security protocols. UO5.3 Explain e-mail security methods and secure mail practices. UO5.4 Describe the role of secure communication	**7**	**12**	**CO5**

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs	FA-TH Max	CO Mapped
	(AH), Encapsulating Security Payload (ESP), transport mode and tunnel mode 5.4 E-mail security: SMTP security issues, PGP, S/MIME and PEM 5.5 Secure e-mail practices and message confidentiality 5.6 Overview of secure communication in enterprise networks	in networked systems.			
6	Database and Cloud Security 6.1 Need of database security and common database threats 6.2 SQL injection attack and methods to reduce database attacks 6.3 Database encryption and access protection methods 6.4 Cloud security fundamentals and cloud security risks 6.5 Security threats in cloud environments and protection measures 6.6 Security best practices for databases and cloud-based services	UO6.1 Explain the need and challenges of database security. UO6.2 Identify SQL injection and database protection techniques. UO6.3 Explain cloud security risks and protection methods. UO6.4 Apply security best practices for data and cloud services.	**8**	**12**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant CO
1	Install and configure antivirus software / endpoint protection software on a computer system and study its features	LLO1.1 Use system security tools and basic protection settings.	**2**	**CO1**
2	Configure privacy, update and security settings in an operating system to protect the system from threats	LLO1.2 Apply privacy and security settings in operating system.	**2**	**CO1**
3	Set up single-level authentication for a computer system and recover a password using any free password recovery tool	LLO2.1 Apply user authentication and password recovery methods.	**2**	**CO2**
4	Grant read, write and execute permissions to file/folder/application and verify access permissions during file sharing	LLO2.2 Assign file and folder permissions.	**2**	**CO2**
5	Write a utility using C / shell script / Python to generate or validate a strong password policy	LLO2.3 Implement strong password authentication.	**2**	**CO2**
6	Implement Caesar cipher / Playfair / Vigenere / Vernam cipher for encryption and decryption of text using C / Python / open-source tool	LLO3.1 Implement substitution cipher techniques.	**2**	**CO3**
7	Implement Rail Fence or Simple Columnar Transposition technique for encryption and decryption of text	LLO3.2 Implement transposition cipher techniques.	**2**	**CO3**

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs.	Relevant CO
8	Generate and verify hash code for a given message and demonstrate steganography using an open-source tool	LLO3.3 Use hashing and steganography tools.	**2**	**CO3**
9	Implement Diffie–Hellman key exchange and create/verify a digital signature using an open-source cryptography tool	LLO4.1 Apply key exchange and digital signature techniques.	**2**	**CO4**
10	Create and verify a digital certificate and configure firewall settings on an operating system	LLO4.2 Generate digital certificate and configure firewall.	**2**	**CO4**
11	Send a secure e-mail using PGP / GnuPG and trace the origin of an e-mail using an e-mail tracking tool	LLO5.1 Use e-mail security and tracking tools.	**2**	**CO5**
12	Demonstrate SQL injection awareness / database protection practices / secure cloud access control using case study or tool-based activity	LLO6.1 Study database and cloud security threats.	**2**	**CO6**
13	Design and implement a mini security solution / secure communication task / database-cloud security case study report	LLO6.2 Develop a mini security implementation task.	**6**	**CO6**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Students shall complete any one or more of the following activities:

1. Prepare a report on the role of digital signatures in secure communication.
2. Compare single-factor and multi-factor authentication with examples.
3. Explain the working of RSA encryption and public-private key generation.
4. Study different types of active and passive cyber attacks with examples.
5. Compare DAC, MAC, RBAC and ABAC in terms of security and flexibility.
6. Implement a mini communication system using cryptography or steganography.
7. Prepare a case study on e-mail security, SQL injection or cloud security threats.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment / Software / Tools Required
1	Computer systems with internet connectivity and updated operating system
2	Antivirus / endpoint security software
3	Password recovery tool / user authentication utility
4	C / Python compiler or IDE for implementing cryptographic techniques
5	Open-source cryptography tools such as Cryptool / GnuPG / OpenStego
6	Firewall configuration enabled operating system
7	E-mail security / mail testing tools
8	Database system / cloud account / browser-based security simulation tools

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Aligned CO	Learning Hours	R-Level	U-Level	A-Level	Total Marks
I	Fundamentals of Computer and Information Security	CO1	8	4	4	4	12
II	User Authentication and Access Control	CO2	7	3	4	5	12
III	Classical Cryptography and Secure Communication	CO3	8	3	4	5	12
IV	Modern Encryption and Digital Security	CO4	7	3	4	3	10
V	Network and E-mail Security	CO5	7	2	4	6	12
VI	Database and Cloud Security	CO6	8	2	4	6	12
	Grand Total		**45**				**70**

I) ASSESMENT TOOL –

Formative Assessment

1. Continuous assessment shall be carried out on the basis of process-related and product-related performance indicators.
2. For each practical, assessment shall be done by assigning 60% weightage to process and 40% weightage to product/output.
3. Term work shall be assessed continuously based on practical performance, timely completion of experiments, journal record, and related learning activities.

Summative Assessment

1. Summative assessment shall be based on laboratory performance and viva-voce.
2. The end-semester practical examination shall evaluate the student's ability to perform the assigned practical, interpret the result, and answer relevant oral questions.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Title of Book	Author(s)
1	Computer Security: Principles and Practice	William Stallings, Lawrie Brown
2	Cryptography and Network Security	Atul Kahate
3	Information Security: Principles and Practices	Mark Merkow, Jim Breithaupt
4	Cryptography and Information Security	V. K. Pachghare
5	Computer Security	Dieter Gollmann

- **SOFTWARE/ TOOLS/ MODELS**

Sr. No.	Software / Tool / Platform	Purpose / Use
1	Antivirus / Endpoint Protection Software	System protection and malware scanning
2	Password recovery and authentication tools	Password recovery and user authentication

		activities
3	C / Python Compiler / IDE	Implementing encryption, decryption and security utilities
4	Cryptool / GnuPG / OpenStego	Cryptography, digital signature and steganography practicals
5	Firewall-enabled operating system / security settings	Firewall configuration and access control
6	Database security testing / browser-based cloud security tools	Database and cloud security activities

- **WEBSITES LINKS**

Sr. No.	Website / Resource	Purpose / Reference
1	NPTEL / SWAYAM courses on Information Security and Cyber Security	Online learning resources for security concepts
2	OWASP resources	Web security, attacks and secure coding awareness
3	Cryptool official resources / tutorials	Cryptography learning and practical reference
4	GnuPG documentation / e-mail security resources	Secure e-mail and encryption reference
5	Tutorials Point / GeeksforGeeks Information Security tutorials	Quick concept revision and practice support
6	Microsoft / Google / Linux operating system security documentation	OS security, firewall and privacy settings reference

K) CO-PO Matrix –

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

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Cloud Computing
Course code	R23CP3405
Course Category	DSE
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	0	4	-	6	4	3	30	70	100	40	25	10	25#	10	25	10	175

Abbreviations:
CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Cloud computing has become a major computing paradigm for delivering software, platforms, infrastructure, storage and services over the Internet. It enables scalable, on-demand and cost-effective access to computing resources for individuals as well as enterprises. In modern computing environments, cloud technologies are widely used for application hosting, virtualization, storage management, service deployment, security enforcement and data-driven services. Therefore, diploma students of Computer Engineering need to understand cloud service models, virtualization concepts, cloud storage, security mechanisms and cloud platforms. This course develops the knowledge and practical skills required to deploy, manage and use cloud-based services and applications.

B) EXPECTED SKILL/s –

After completing this course, the student will be able to identify suitable cloud service and deployment models for various applications, create and manage virtual machines in a cloud environment, use cloud storage and cloud-based service platforms effectively, apply security mechanisms in cloud computing systems, develop and deploy basic cloud-based applications, and explore cloud platforms along with IoT integration and recent trends in cloud computing.

C) COURSE OUTCOMES (COs)

1. Explain basic cloud computing concepts.
2. Use virtualization in cloud environments.
3. Manage cloud storage and data center services.

4. Apply cloud service management and SLA concepts.
5. Implement security features in cloud computing.
6. Use cloud platforms for modern applications.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	Fundamentals of Cloud Computing 1.1 Introduction to cloud computing, need and characteristics of cloud computing 1.2 Cloud deployment models – public cloud, private cloud, community cloud, hybrid cloud 1.3 Cloud service models – IaaS, PaaS, SaaS 1.4 Benefits and limitations of cloud computing 1.5 Basic architecture and infrastructure components of cloud computing	UO1.1 Describe the concept and characteristics of cloud computing. UO1.2 Compare various cloud deployment models. UO1.3 Distinguish between IaaS, PaaS and SaaS service models. UO1.4 Explain the architecture and benefits of cloud computing.	**7**	**12**	**CO1**
2	Virtualization in Cloud 2.1 Introduction to virtualization and virtualized environment 2.2 Types of virtualization – server, storage, network, desktop and application virtualization 2.3 Virtualization technologies and platforms 2.4 Virtual machine creation, configuration and lifecycle 2.5 VM migration, consolidation and VM management 2.6 Advantages and limitations of virtualization	UO2.1 Explain the concept and features of virtualization. UO2.2 Compare different types of virtualization. UO2.3 Create and configure a virtual machine. UO2.4 Explain VM migration and VM management.	**8**	**12**	**CO2**
3	Cloud Storage and Data Center Services 3.1 Cloud storage architecture and storage services 3.2 Virtual data center (VDC) architecture and components 3.3 Storage, server, desktop and application virtualization in cloud data centers 3.4 Distributed cloud file systems – Google File System (GFS) and Hadoop Distributed File System (HDFS) 3.5 Features, advantages and limitations of GFS and HDFS 3.6 Data replication, load balancing and high availability concepts	UO3.1 Explain cloud storage architecture and services. UO3.2 Describe VDC components and cloud data center services. UO3.3 Compare GFS and HDFS. UO3.4 Explain replication, load balancing and availability mechanisms.	**8**	**12**	**CO3**
4	Cloud Service Management and SLA 4.1 Cloud service providers, cloud users and federated cloud environment 4.2 Service Level Agreement (SLA): concept,	UO4.1 Explain the role of service providers and users in cloud computing. UO4.2 Describe the purpose and structure of SLA. UO4.3	**7**	**10**	**CO4**

	importance and components 4.3 SLA management process and phases 4.4 Types of SLA – infrastructure SLA and application SLA 4.5 SLA lifecycle – definition, negotiation, publishing, discovery, operationalization and termination 4.6 Cloud service lifecycle – planning, creation, operation and termination	Explain SLA lifecycle and service management phases. UO4.4 Describe the cloud service lifecycle.			
5	Cloud Security and Identity Management 5.1 Security issues in cloud computing 5.2 Cloud security concepts – multi-tenancy, virtualization security, trust management and metadata security 5.3 Cloud risks – organizational, technical and legal risks 5.4 Data security techniques in cloud 5.5 Identity and Access Management (IAM) in cloud 5.6 Security-as-a-Service and content-level security	UO5.1 Explain security issues and risks in cloud computing. UO5.2 Apply data security and access control concepts. UO5.3 Explain identity and access management in cloud. UO5.4 Describe Security-as-a-Service features.	**8**	**12**	**CO5**
6	Cloud Platforms, IoT and Emerging Trends 6.1 Cloud platforms and services – AWS, Google Cloud, OpenStack, Open Nebula 6.2 Cloud support for web and enterprise applications 6.3 Cloud and IoT integration 6.4 IoT enabling technologies – RFID, sensors, ZigBee, GPS 6.5 Cloud-based IoT applications in healthcare, business and consumer systems 6.6 Recent trends in cloud computing and smart applications	UO6.1 Identify popular cloud platforms and their services. UO6.2 Explain the use of cloud in web, enterprise and IoT applications. UO6.3 Describe enabling technologies for cloud-based IoT systems. UO6.4 Explain emerging trends in cloud computing.	**7**	**12**	**CO6**

E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Practical / Tutorial Title	Hours	Relevant CO
1	Study of cloud service providers and comparison of cloud service models	2	CO1
2	Create and share documents using Google Docs / Google Workspace cloud tools	2	CO1
3	Configure basic cloud storage using Google Drive / JustCloud / any cloud storage tool	2	CO1
4	Install virtualization software and create a virtual machine	2	CO2
5	Configure VM settings, clone VM and perform snapshot operations	2	CO2
6	Study and demonstrate VM migration / resource allocation in a virtualized environment	2	CO2
7	Implement storage service on cloud using OpenStack / any cloud	2	CO3

	simulator		
8	Create a file system using HDFS / study distributed storage mechanism	2	CO3
9	Create and host a simple web application on a cloud platform	2	CO4
10	Study SLA of any cloud service provider and prepare comparative report	2	CO4
11	Implement Identity and Access Management (IAM) features on a cloud platform	2	CO5
12	Configure cloud security settings / user access policy / server security using available tools	2	CO5
13	Design and deploy a small cloud-based IoT / smart application case study or mini implementation	6	CO6

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT , ASSIGNMENTS AND SPECIFIC LEARNING ACTIVITIES) –

Mini Project / Assignments / Specific Learning Activities)

Students shall complete any one or more of the following activities:

1. Prepare a report on Amazon Web Services (AWS) or Google Cloud Platform services.
2. Study and compare OpenStack, AWS and Google Cloud for education or business use.
3. Prepare a case study on cloud security issues and solutions.
4. Develop a mini cloud-based application such as online notes, file sharing or attendance dashboard.
5. Prepare a report on IoT applications integrated with cloud computing.
6. Study SLA documents of public cloud providers and summarize major service commitments.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment / Software / Tools Required
1	Computer systems with minimum 8 GB RAM and internet connectivity
2	Virtualization software such as VMware / VirtualBox
3	Access to cloud platforms such as Google Cloud / AWS Educate / OpenStack sandbox
4	Python / Java / Web development tools for cloud application deployment
5	Hadoop / HDFS demo environment or cloud storage tools
6	IoT kit / simulator (optional) for cloud-IoT practical

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE –

Sr. No.	Unit No.	Unit Title	Aligned CO	Learning Hours	R Level	U Level	A Level	Total Marks
1	I	Fundamentals of Cloud Computing	CO1	7	4	4	4	12
2	II	Virtualization in Cloud	CO2	8	3	4	5	12
3	III	Cloud Storage and Data Center Services	CO3	8	3	4	5	12
4	IV	Cloud Service Management	CO4	7	3	4	3	10

		and SLA						
5	V	Cloud Security and Identity Management	CO5	8	2	4	6	12
6	VI	Cloud Platforms, IoT and Emerging Trends	CO6	7	2	4	6	12
Grand Total				45				70

I) ASSESMENT TOOL –

Formative Assessment

1. Continuous assessment based on process and product related performance indicators.
2. Each practical shall be assessed by considering 60% weightage to process and 40% weightage to product.
3. A continuous assessment-based term work shall be maintained for practical and laboratory activities.

Summative Assessment

1. Assessment based on laboratory performance and viva-voce.
2. End-semester practical examination shall be conducted based on the execution of practicals, performance, and oral examination.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Title of Book	Author(s)
1	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej Goscinski
2	Cloud Computing: A Hands-On Approach	Arshdeep Bahga, Vijay Madisetti
3	Mastering Cloud Computing	Christian Vecchiola, Rajkumar Buyya, S. Thamarai Selvi
4	Cloud Computing	Shailendra Singh
5	Cloud Computing: Concepts, Technology & Architecture	Thomas Erl, Ricardo Puttini, Zaigham Mahmood

- **SOFTWARE/ TOOLS/ MODELS**

Sr. No.	Software / Tool / Platform	Purpose / Use
1	VMware / Oracle VirtualBox	Creating and managing virtual machines
2	OpenStack / Open Nebula	Cloud platform and infrastructure management

3	Google Cloud Platform / AWS Educate / Microsoft Azure	Cloud service deployment and platform-based learning
4	Hadoop / HDFS Environment	Distributed storage and cloud data processing
5	Python / Java / Web Development Stack	Cloud-based application development and deployment

- **WEBSITES LINKS**

Sr. No.	Website / Resource	Purpose / Reference
1	NPTEL / SWAYAM Cloud Computing Courses	Online learning resources for cloud computing concepts
2	Google Cloud Documentation	Reference for cloud services, deployment and documentation
3	AWS Academy / AWS Educate Resources	Learning cloud services, labs and educational resources
4	Open Stack Official Documentation	Study of cloud platform setup and service management
5	GeeksforGeeks Cloud Computing and Virtualization Tutorials	Quick reference and tutorial support
6	Tutorials Point / Java TPoint Cloud Computing References	Concept revision and practical learning support

K) CO-PO Matrix –

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	1	–	–	1	–	–	1
CO2	3	2	2	2	1	1	1	1	–	1
CO3	3	2	2	2	1	1	1	1	1	1
CO4	2	2	2	1	1	2	1	–	1	1
CO5	2	2	2	2	2	1	1	1	1	1
CO6	2	2	2	2	1	1	2	–	2	2

Legends: - High:03, Medium:02, Low:01, No Mapping: -

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Data Analytics And Visualisation Using R/Python
Course code	R23CP3406
Course Category	DSE
Credits	4

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme											
Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

Total IKS Hrs for Sem.: 0 Hrs

Abbreviations:

CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

A) RATIONALE

Data Analytics uses statistical and computational methods to analyze data, aiding informed decision-making. A Data Analyst collects, cleans, and visualizes Datasets to solve problems.

B) EXPECTED SKILL/s –

Perform Data Analytics in various business domains for improved decision making.

C) COURSE OUTCOMES (COs) -

Students will be able to

1. Elaborate the fundamental concepts of Data Analytics.
2. Apply appropriate statistical techniques to analyze and interpret complex Datasets.
3. Analyze numerical data by creating pivot table.
4. Represent data in terms of various types of charts.
5. Perform data manipulation using R
6. Visualize the data using a R/Python.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
1	**1.1 Introduction to Data Analytics** Data Analysis An Overview, Importance of Data Analytics Types- Text Analysis ,Statistical Analysis, Diagnostic Analysis , Predictive Analysis , Prescriptive Analysis , Methods Cluster analysis, Cohort analysis, Regression analysis, Neural networks, Factor analysis, Data Mining, Data Analysis Techniques **1.2 Getting started with R:** introduction, Features of R, Applications of R, installation of R compilers, online compliers. **1.3 R comments:** single line and multi-line comments. **1.4 R variable and constants:** Types of variables: Boolean, Integer, Floating, character, string. Types of constants: Integer, Numeric, logical, string, complex and special constants, built-in R constants. **1.5 R data type:** Type of data type: logical, numeric, Integer, complex, character, raw. **1.6 R print output:** Print() Paste() Sprint() Cat() **1.7 R numbers**: Numeric, integer, complex.	Understand fundamentals of data analytics Write simple R programs Use R data types Understand R variable and constants Understand R variable and constants	**9**	**15**	**CO1**
2	**2.1 R Boolean Expression :** Comparison and Logical Operators, R Boolean With Comparison Operators, R Boolean with Logical Operators -AND Operator (&), OR Operator (|), NOT Operator (!) **2.2 R if...else :** R if statements ,R if…else statements if…else if…else statements, Nested if...else statements, R ifelse() Function **2.3 R Loop :** while loops, for loops, nested for loop, repeat loops, R infinite repeat loop, repeat loop with next statement **2.4 R break and next :** R break statement, Break Statement in Nested Loop, R next statement **2.5 R Functions** :	Use various flow control statements Write R programs using flow control statements R programs using R functions	**7**	**10**	**CO2**

	Call the Function, Named Arguments, Default Parameters Values, Return Values, Nested Function.				
3	**3.1 R string:** String operations: Find the length of a string, Join two strings, Compare two strings, Change the string case, Escape sequence, Multiple string **3.2 R vector:** create, access, modify, numeric, repeat, loop over R vector, length of vector **3.3 R matrix:** create, access, modify, combine two matrices in R (cbind() and rbind()) **3.4 R list:** access, modify, add items to R list, remove items from list, length of R list, loop over R list. **3.5 R array:** create, access, length of array. **3.6 R data frame:** create, access, combine data frame, length of data frame. **3.7 R factor:** create, access, modify.	Understand R data structures Implement R data structures	**6**	**10**	**CO3**
4	**4.1 R Bar Plot:** Create Bar Plot, Add Title to Bar Plot, Provide Labels to Axes, Provide Names for each bar of bar plot, change bar color in R, Bar texture in R, Make bar plot horizontal, Stacked bar plot. **4.2 R Histogram:** Create Histogram, Add title and label to Histogram, Change bar color of histogram, Range of axes in R. **4.3 R Pie Chart:** Create Pie Chart, Add Title to Pie Chart, Add Labels to each Pie Chart slice, Change color of Pie Slices, Create a 3D Pie Chart. **4.4 R Boxplot:** Dataset to create boxplot, create boxplot, add title and label and new color to a boxplot, boxplot formula in R, add notch to boxplot. **4.5 R Strip Chart:** Dataset to create strip chart, create strip chart, add title and label and new color to a strip chart, jitter plot in R, multiple strip charts. **4.6 R plot() Function:** Plot one point in R, Plot multiple points in R, plot sequence of points in R, draw a line in	Represent data in visual form using R	**7**	**10**	**CO4**

	R, different plot types in R, add title and label to a plot in R, plot trigonometric function. **4.7 R Save Plot:** Save plot as bitmap image, save plot as vector image. **4.8 R Color:** Add color to plot, using color names to change plot color, using hex values as colors, using RGB values to color plot, color cycling in R, using color palette in R.				
5	**5.1 R Read and Write CSV Files :** Number of Rows and Columns of CSV File in R,Using min() and max() With CSV Files,Subset of a CSV File in R,Write Into CSV File in R **5.2 Read and Write xlsx Files:** xlsx rowIndex and colIndex Argument in R,xlsx startRow Argument in R,Write Into xlsx File in R,Rename Current Worksheet. **5.3 R dataset:** built in datasets Display Variables Value in R Sort Variables Value in R Statistical Summary of Data. **5.4 R min() and max():** Min, First Quartile, Median, Mean, Third Quartile , Max. **5.5 R Mean, Median, and Mode**: calculations.	Manipulate data using R	7	10	CO5
6	**6.1 R Date:** Get current system date and time,Get current system date and time using R lubridate package**,** Extraction Years, Months, and Days from Multiple Date Values in R**,**Manipulate multiple date values in R**,**Using update() to update multiple dates values in R **6.2 Data Visualization using Python**: Overview of Matplotlib and its role in data visualization, Installing and setting up Matplotlib in Python. Basic plotting with Matplotlib, Line plot, Scatter plots, Bar charts, Histograms, adding titles, labels, and legends to plots. Changing figure size and aspect ratio, Customizing axes (limits,	Represent data in visual form using python	**9**	**15**	**CO6**

	ticks, and labels). Exporting and Saving Visualizations: Saving plots in different formats (PNG, PDF, SVG), Adjusting the resolution and quality of saved plots, creating interactive visualizations using Matplotlib widgets.				

E) PRACTICAL (BASED ON LLO& TLO) ASSESMENT WORK –

Sr. No	Laboratory Experiment / Practical Titles / Tutorial Titles	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Number of Hrs.	Relevant COs
1.	Installing R and Studio Using R as a calculator (Basic Arithmetic operations) Creating variables	LLO 1.1 Understand R environment and basic commands.	**4**	**CO1**
2.	Vectors Lists Matrices Data Frames	LLO 2.1 Use Data Types and Data Structures in R.	**2**	**CO1** **CO3**
3.	Reading CSV files Writing data to files	LLO 3.1 Learn Importing and Exporting Data.	**2**	**CO4** **CO5**
4.	Filtering rows Selecting columns Sorting data	LLO 4.1Clean and prepare data – Data Manipulation.	**2**	**CO5**
5.	Mean, median, mode Variance and standard deviation	LLO 5.1 Summarize data.	**2**	**CO5**
6.	Bar chart Histogram Pie chart Box plot	LLO 4.2 Represent data graphically- Data Visualization Using R.	**2**	**CO4**
7.	Detecting NA values Removing or replacing NA	LLO 5.2 Clean incomplete data-Handling Missing Values.	**2**	**CO5**
8.	Correlation Simple linear regression	LLO 4.3 Find relationships between variables.	**2**	**CO4**
9.	Bar chart Histogram Pie chart Box plot	LLO 6.1 Represent data graphically- Data Visualization Using Python.	**2**	**CO6**
10.	Analyze student performance Sales data analysis Weather data analysis	Apply concepts on real data.	**4**	**ALL**

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the Virtual Labs from IIT.
- Students should be encouraged to participate in various coding

competitions, such as hackathons, online coding contests on websites like hacker rank, Code chef etc.

- At the institution level, encourage students to start a coding club.
- Mini-Project: Develop a mini project using R Programming like Student result analysis, Sports performance analytics, and School survey data analysis.

Self Learning

- Students are encouraged to register themselves in various MOOC's such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

- Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a micro project is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive micro projects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Microsoft Office ,Office 365	All
2	Software: Editor: R and Python setup	All
3	R Studio and Python Interpreter / IDE (Any open source python distribution such as anaconda etc) (Any open-source IDE such IDLE, Jupyter Notebook, Spyder, PyCharm etc.)	All

H) SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table) –

Unit No.	Unit Title	Teaching Hours	R Level	U Level	A Level	Total Marks
1.	Introduction to Data Analytics and R Programming	9	5	5	5	15
2.	R Flow Control	7	2	4	4	10
3.	R Data Structure	6	2	4	4	10
4.	R Data Visualization	7	2	4	4	10
5.	R Data Manipulation	7	2	4	4	10
6.	Data Visualization Using R and Python	9	5	5	5	15
	Total	45	18	26	26	70

I) ASSESMENT TOOL –

- **Formative assessment**
  1) Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 1) 60% weightage is to process
  2) 40% weightage to product.
- **Summative Assessment**

  1) End Semester Examination, Lab Performance, Viva-voce

3) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	# Jared P.Lander	R for Everyone: Advanced Analytics and Graphics	Pearson ISBN-13: 9780134546995 (2017 update)
2	Fabio Nelli	Python Data Analytics: With Pandas , NumPy, and Matplotlib	A press publications ISBN-13 :978-1484239124ISBN-13978-1484247372

- **WEBSITES LINKS**

Sr. No.	Link / Portal
1.	https://www.programiz.com/r
2.	https://www.w3schools.com/r/
3.	https://www.simplilearn.com/tutorials/excel-tutorial/data- analysis-excel
4.	https://www.freecodecamp.org/news/introduction-to-data-vizualization-using-matplotlib/
5.	https://archive.nptel.ac.in/courses/106/107/106107220/
6.	https://matplotlib.org/

Note:
• Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

4) CO-PO-PSO Matrix –

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

Legends: - High:03, Medium:02, Low:01, No Mapping: -