

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE -411011
PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING AND IoT

R23 CURRICULAM

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Sr. No.	Category	Course Code	Course Title	
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30		R23CI2609	IoT Architecture and Protocols	
31		R23CI2611	Wireless Ad hoc Network	
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43		R23CI3604	Information Security	
44		R23CI3605	Cloud Security	
45		R23CI3606	Big Data Analytics	

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering and IoT
Course Name	Basic Mathematics
Course code	R23CI1701
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	
C L	T L	L L					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
									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	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	14	10	CO2

	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.	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 Sulbasutras.			
3	Straight Line 3.1 Calculate angle between given two 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 Sulbasutras to solve the given problems.	3.1 Straight line and slope of straight line: Angle between two lines, 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 Sulbasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).	08	10	CO3
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	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	06	10	CO4

	differentiation to calculate maxima, minima of the given function. 5.3 Familiar with concept of calculus given in Indian Mathematics.	System: The Discovery of Calculus by Indian Astronomers. (Indian Mathematics).			
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 an 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 $y = x^{\sin x}$ 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 –

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

Sr.No	Unit	Unit Title	Aligned COs	R-Level	U-Level	A-Level	Total Marks
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) 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	2	1	-	-	-	-	1			
CO2	2	1	-	-	-	-	1			
CO3	1	1	-	-	-	-	-			
CO4	2	1	-	-	-	-	1			
CO5	2	1	-	-	-	-	1			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

K) 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 Mathematics	S Chand publication New Delhi 2008 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.
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.

Name and Signature	
(Courses Expert)	
Names and Signature	Name and Signature
Programme Head	CDC In-Charge

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering and IoT
Course Name	Applied Mathematics
Course code	R23CI1703
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				Tutorial (Based on LL & TL)				Based on Self Learning		Total Marks		
C L	T L	L L					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 hr	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 programme 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	CO4
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	CO5

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	CO3
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	CO4

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) 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

G) ASSESMENT TOOL –

- **Formative assessment**
2) 2 unit test , each of 30 marks and average of 2 unit test
- **Summative Assessment**
End semester Assessment Theory Examination of 70 marks

H) 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	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, No Mapping: -

*PSOs are to be formulated at institute level

I) 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	Kreyszig, 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 (India) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
7	Marvin L. Bittinger David J. Ellenbogen Scott A. Sargent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
8	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)

• SOFTWARE/ TOOLS/ MODELS

Open-source software like wolfram alpha, SageMaths, MATHS3D, GeoGebra, Graph, DPLLOT, 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
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes

Sr.No	Link / Portal	Description
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.

Name And Signature (Courses Experts)	
Name And Signature Programme Head	Name And Signature CDC In-charge

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Programming In C
Course Code	R23CI1601
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		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:

CO1 - Develop C program using input - output functions and arithmetic expressions

CO2 - Develop C program involving branching and looping statements

CO3 - Implement Arrays and structures using C programs

CO4 - Develop C program using user-defined functions

CO5 - Write C program using pointer

CO6 - 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	FATH 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. LO3.3 Declare, 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
	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. LO 5.6 Access individual variable of structure using Pointer.	9	10	CO5
	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	Number of Hrs.	Relevant COs	Practical / Tutorial / Laboratory Learning Outcome (LLO)
1	*Install and study the C programming environment.	2	CO1	LLO 1.1 Write logical steps for given program flow. LLO 1.2 Write standard English-like statements for programming flow of given problem statement.
2	Implement C programs using Constants and Variables.	2	CO1	LLO 2.1 Write simple C program using constants and variables. LLO 2.2 Use arithmetic operators for developing C programs.
3	*Implement C programs using arithmetic operators to solve given arithmetic operations.	2	CO1	LLO 3.1 Use arithmetic operators in C program.
4	Implement C programs using implicit and explicit data type conversion.	2	CO1	LLO 4.1 Write code for type casting in C.
5	*Write well-commented C programs using formatted Input/Output statements.	4	CO1	LLO 5.1 Write C code for displaying formatted output with comments wherever applicable.
6	*Implement minimum two C programs using Relational and Conditional Operators.	2	CO1, CO2	LLO 6.1 Use relational and logical operators in C. LLO 6.2 Write C program using relational and logical operators.
7	*Implement minimum two C programs using Logical Operators.	2	CO1, CO2	LLO 7.1 Use logical operators in given expressions.
8	Implement minimum two C programs using Bitwise Operators.	2	CO1, CO2	LLO 8.1 Write expressions using bitwise operators.
9	Implement minimum two C programs using simple if statement and if...else statement.	2	CO2	LLO 9.1 Write syntax for various if statements. LLO 9.2 Write C program using if statements.
10	*Implement minimum two C programs using nested if...else and if...else-if ladder.	4	CO2	LLO 10.1 Write syntax of if...else statements.
11	*Develop C program using Switch statements.	2	CO2	LLO 11.1 Write syntax of Switch statement.
12	*Write a C program to print English calendar months using Switch statement.	2	CO2	LLO 12.1 Write C program using Switch statement.
13	*Implement minimum two C programs using while and do...while loops.	2	CO2	LLO 13.1 Implement iterative solutions using while and do...while loops.
14	Implement C programs using for loop statement.	2	CO1, CO2	LLO 14.1 Write syntax for for statement. LLO 14.2 Write C code using for loop.
15	*Print various patterns using loops.	2	CO2	LLO 15.1 Write syntax for while, do...while and for loops.
16	*Implement C programs using One Dimensional Array.	2	CO2, CO3	LLO 16.1 Declare and initialize arrays. LLO 16.2 Implement one-dimensional arrays.
17	*Implement C programs using Two-Dimensional Array.	4	CO3	LLO 17.1 Declare and initialize two-dimensional arrays. LLO 17.2 Implement two-dimensional arrays.
18	*Write C programs for string operations without standard string functions.	2	CO3	LLO 18.1 Declare character arrays as strings. LLO 18.2 Perform string operations.
19	Implement Structure in C.	4	CO3	LLO 19.1 Declare, define and access structure variables.
20	*Implement Array of Structure in C.	2	CO3	LLO 20.1 Write C programs using Array of Structure.
21	*Develop C program using in-built mathematical and string functions.	2	CO4	LLO 21.1 Use built-in library functions in C.
22	*Write C program to demonstrate User Defined Functions.	4	CO4	LLO 22.1 Write C programs using user-defined functions.
23	Implement recursive functions in C program.	2	CO4	LLO 23.1 Write recursive functions in C.

24	*Write C Program to print addresses and values using Pointer.	2	CO5	LLO 24.1 Declare and initialize pointer variables. LLO 24.2 Access variables using pointers.
25	*Implement C Programs using Pointer arithmetic.	2	CO5	LLO 25.1 Perform arithmetic operations using pointers.
26	*Implement Program to read and write a file.	2	CO6	LLO 26.1 Program to read and write a file.
27	*Develop C program to demonstrate file operations.	2	CO6	LLO 26.2 Program to perform file operations.
28	Develop C Program to Sense Available Networks using Arduino.	2	CO6	LLO 26.3 Program to sense available networks.
29	Develop C Program to Measure Distance Using Ultrasonic Sensor and Blink LED using Arduino.	2	CO6	LLO 26.4 Program to measure distance using ultrasonic sensor.
30	Write C Program to Detect Vibration Using Arduino.	2	CO6	LLO 26.5 Program to detect vibration of an object.
31	Implement C Program to Connect with Available Wi-Fi using Arduino.	2	CO6	LLO 26.5 Program to connect with available Wi-Fi.
32	Write C Program to Sense Finger Placement using Arduino.	2	CO6	LLO 26.6 Program to sense finger placement.
33	Write Program for Temperature Notification using Arduino.	2	CO6	LLO 26.7 Program for temperature notification.

Note: Out of above suggestive LLOs-

*Marked Practical's (LLOs) 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

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 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
3	ARDUINO,Wi-FiModuleorESP8266Module,Ultrasonicsensor,Jumperwires, Vibration sensor, Touch Sensor, Temperature and humidity sensor, Connecting cable or USB cable,	26.3To26.7

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	3	4	3	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	19	26	25	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% weight age to process.
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. Balaguruswamy	Programming in ANSI 'C'	Mcgraw Hill Publications ISBN0070534772
2	Yashwant Kanetkar	Letus 'C'	BPB Publication ISBN9788183331630
3	David Griffiths, Dawn Griffiths	Head First C	O'Reilly Media, Inc. ISBN:9781449345013
4	Coimbatore Institute of Information Technology, Coimbatore	IoT Applications	ISBN 978-93-89105-56-8

- **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 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	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: -										

Name & Signature: 	
(Course Experts)	
Name & Signature: (Programme Head)	Name & Signature: (CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Animation Techniques
Course code	R23CI1602
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
C L	T L	L L					FA TH	SA- TH	Total	FA-PR		SA-PR		SLA			
										Max	Min	Max	Min	Max	Min	Max	
2	-	4	2	8	4	-	-	-	-	50	20	-	-	25	10	75	

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.

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 OpenGL and 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 keyframes, 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	Unit - I 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	Unit – 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 2.2 Use 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	Unit – 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. 3.3 OpenGL 2D-3D functions: 2D Coordinate System, 2D Textures, 3D Coordinate System, Drawing 3D Shapes, Lighting and Shading.	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 content within the window using OpenGL commands. TLO 3.3 Apply textures, lightning and shading to 2D and 3D objects.	6	-	CO3
4	Unit – 4 3D Modeling and Animations 4.1 Introduction to tool - Blender 4.2 3D Modelling techniques (Extrusions, Loops) 4.3 Lighting and Texturing 4.4 Animations: Introduction, Animation Tools (Keyframes)	TLO 4.1 Understand the Basics of Blender TLO 4.2 Apply 3D Modeling Techniques TLO 4.3 Understand and Lighting Techniques TLO 4.4 Create Basic Animations	6	-	CO4
5	Unit – 5 Animation Fundamentals and Texturing 5.1 Keyframes Animation, Interpolation techniques. 5.2 Animation principles (Squash, Stretch, Anticipation, etc). 5.3 Introduction to texturing.	TLO 5.1 Understand and Apply Keyframe Animation TLO 5.2 Apply 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	Unit – 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 6.2 Use color correction tools to adjust brightness, contrast, saturation, and color balance TLO 6.3 Combine 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 program in 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 modeling 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 modeling 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	4	CO5

		a vintage table lamp.		
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 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	Computer system - (Any computer system with basic configuration)	All
2	Blender Tool, Audio-video editing tool like DaVinci 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
-	-	-	-	-	-	-

I) ASSESMENT TOOL –

- **Formative assessment**
 - A continuous assessment-based term work
- **Summative Assessment**

J) 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

- **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	3	2	1	1	2	1	1	2	1	1
CO2	3	3	2	2	3	1	1	3	2	1
CO3	3	3	3	2	3	1	1	3	3	1
CO4	2	2	3	2	3	1	1	3	3	2
CO5	2	2	3	2	3	1	1	3	3	2
CO6	2	2	2	2	3	2	1	2	3	3

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Python Programming
Course code	R23CI1603
Course Category	AEC
Credits	3

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme					Credits	Assessment Scheme												
Contact			Self-Learning (Term Work + Assignment)	Notional Learning Hrs / Week		Paper Duration (hrs.)	Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks	
C L	T L	L L					FA TH	SA- TH	Total		FA-PR		SA-PR		SLA			
									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	

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.

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

A) RATIONALE

Python is a Powerful, flexible and easy to use language. Python is a general purpose dynamic programming language. It has user friendly data structures and it has expensive support of libraries. Python syntax is very easy and code is very readable. Python is used for developing web applications, data science and rapid application development in many areas on most platforms.

B) EXPECTED SKILL/s –

C) COURSE OUTCOMES (COs)

1. Install and develop simple Python program using IDE and develop python program using operators.
2. Write a program using conditional and looping statements.
3. Perform operations using Python Data Structures.
4. Develop Python program using functions, modules and packages.
5. Apply object-oriented approach to solve given problem using python.
6. Write program using Exception handling and File Operations.

D) COURSE CONTENT

Unit No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FATH MAX.	CO Mapped
1	Introduction to Python: 1.1 Introduction to Python Comparison between C and Python. Python Features, Installation and Working with Python 1.2: Python building blocks- Identifiers, Keywords, Indention, Variables, Comments, Execution of Python program, Python script to display "Welcome" message. 3: Basic input output operations: input(), print(), Python Data types, Python Escape Character 1.4: Operators: Arithmetic, Relational, Assignment, Logical, And Bitwise, Membership and Identity operator.	TLO 1.1 Explain given feature of python. TLO 1.2 Write python program to perform basic input output operations. TLO 1.3 Write python program to solve given expression.	7	10	CO1
2	Control flow Statements 2.1 Conditional Statements- if, if-else, if-elif-else (ladder), nested if. 2.2 Python Looping – for loop, while loop and nested loops. Use of pass, continue, break, and else in looping. 2.3: Python Data types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of data types.	TLO 2.1. Implement given decisio making statements and looping statements in python program. TLO 2.2. Understand data types.	7	10	CO2
3	Data Structures in Python 3.1 Python Lists: Defining lists, accessing values in list, deleting values in list, Updating lists Basic list operations Built-in functions/methods. 3.2 Python Tuples: Accessing values in Tuples and deleting values in Tuples. Basic Tuple operations. Built-in Functions/methods. 3.3 Python Sets: Accessing values in set, deleting values in set and updating Sets. Basic Set Operations. Built-in set Functions/methods. 3.4 Python Dictionaries: Accessing values in dictionary, deleting values in dictionary and updating Sets. Basic dictionary Operations. Built-in dictionary Functions/methods.	TLO 3.1. Write Python program to use and manipulate list is for the given problem TLO 3.2. Write Python program to use and manipulate Tuples for the given problem TLO 3.3. Write python program to use and manipulate Sets for the given problem TLO 3.4. Write python program to use and manipulate Dictionaries for the given problem	8	15	CO3

4	Unit 4-Python Functions, Modules, and Package: 4.1 Python built-in function- in Functions (e.g. type/data conversion functions, math functions etc.) 4.2 User defined functions: Function definition, Function calling, function arguments and parameter passing, Function with default argument, Keyword argument, Variable length argument, Return statement, Lambda function, Advantages of user defined functions, Scope of Variables: Global variable and Local Variable. 4.3 Modules: Writing modules, importing modules, importing objects from modules, Overview of python built-in modules (e.g. Numeric and mathematical module, Functional Programming Module) Namespace and Scoping. 4.4 Python Packages: Introduction, Writing Python packages, overview of packages (e.g. math, Numpy, matplotlib, pandas etc) and user defined packages	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.	8	15	CO4
5	Object Oriented Programming in Python 5.1 Object oriented Concepts: Creating class, Creating object 5.2 Constructors in python (Parameterized & Non-Parameterized), the self parameter 5.3 Polymorphism: Method Overloading and Overriding 5.4 Data Hiding / Abstraction 5.5 Inheritance: Single Inheritance, Multiple Inheritance, Multilevel Inheritance	TLO 5.1 Write python program using classes and objects to solve given problem. TLO 5.2 Implement python program using different types of constructors. TLO 5.3 Write program to demonstrate polymorphism. TLO 5.4 Write python code using data abstraction for given problem. TLO 5.5 Apply inheritance for the given problem.	7	10	CO5
6	Exception Handling and File Handling 5.1 Exception Handling: Introduction, Exception handling – ‘try:except:’ Statement, ‘raise’ Statement, User defined exceptions. 5.2 File Handling: Opening file in different modes, Reading and writing files, Directories in Python, File and directory related standard functions.	TLO 6.1 Write Python code for the given reading values from keyboard TLO 6.2 Read data from the given file. TLO 6.3 Write the given data to a file. TLO 6.4 Handle the given Exceptions through Python program.	8	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.	a) Install and configure Python IDE	LLO 1.1 Install the given	2	CO1
2.	b) Develop a program to using operators: i) Arithmetic Operators ii) Logical operators iii) Bitwise Operators	Python IDE. LLO 1.2 Write python program to solve given expression.	2	CO2
3.	Develop a program to using conditional Statements: a) 'if' Statement b) 'if..else' Statement c) Nested loops	LLO 2.1 Write python program for solving given problem using various if statements.	4	CO2
4.	Develop a program to Perform following operations on Lists: a) Create list b) Access list c) Update list(Add item, Remove item) d) Delete list	LLO 3.1 Write python program to perform operations on list.	2	CO3
5.	Implement python program to perform following operations on the Tuple: a) Create a Tuple b) Access Tuple c) Print Tuple d) Convert tuple into list and viceversa e) Delete Tuple	LLO 4.1 Write python program to perform operations on tuple.	2	CO3
6.	Implement a python program to perform following operations on the Set: a) Create a Set b) Access Set c) Update Set d) Delete Set	LLO 5.1 Write python program to manipulate the set.	2	CO3
7.	Implement a python program to perform following operations on the Dictionary: a) Create a Dictionary b) Access Dictionary c) Update Dictionary d) Delete Dictionary	LLO 6.1 Write python program to perform operations on dictionary.	2	CO3
8.	Implement user defined function for given problem: a) a) Built-in Function (e.g. math, number, operator) b) User defined Function	LLO 7.1 Write python program to create function by selecting appropriate type of argument.	2	CO4

9.	Develop a program to demonstrate use of: c) Built-in module (e.g. math, number, operator) d) User defined module	LLO 8.1 Select appropriate module to solve given problem. LLO 8.2 Write user defined module to solve given problem.	2	CO4
10.	Develop a program to demonstrate use of: a) Built-in Packages(e.g. NumPy,Pandas) b) User defined packages	LLO 9.1 Write Built-in Packages to solve given problem. LLO 9.2 Write user defined package to solve given problem.	2	CO4
11.	Write a python program to implement a). Single inheritance b). Multiple Inheritance c). Multilevel inheritance	LLO 10.1 Select appropriate type of inheritance to solve given problem. LLO 10.2 Write python program using inheritance to solve given problem.	2	CO5
12.	Develop a program in Python to handle user defined exception for given problems	LLO 11.1 Write program using Exception handling	2	CO6
13.	Develop a program in Python to handle File related Operations	LLO 11.1 Write program for File Operations.	2	CO6

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

Mini project:

- Develop a mini-project using Python Programming.

Assignment:

- Solve assignment covering all COs given by teacher.

Note:•

Above is just a suggestive list of microprojects 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	Python Interpreter / IDE a) (Any open source python distribution such as anaconda etc) b) (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	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to Python	7	3	4	3	10
2.	Control flow Statements	7	3	4	3	10
3.	Data Structures in Python	8	3	6	6	15
4.	Python Functions, Modules, and Package	8	3	6	6	15
5.	Object Oriented Programming in Python	7	3	4	3	10
6.	Exception Handling and File Handling	8	3	4	3	10
		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**
 - 1) End semester examination, Lab performance, Viva voce

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, NewDelhi, ISBN: 9789386173348

• **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_0130944397935001602592_shared/overview	Python for Beginners
6	https://www.geeksforgeeks.org/python-gui-tkinter/	Python GUI Programming
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 OUTCOMES	PROGRAM OUTCOMES							PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	-	3	-	-	1	1	2
CO 2	3	2	2	-	2	-	-	-	1	2
CO 3	3	2	2	1	2	-	-	-	2	2
CO 4	3	2	3	1	2	-	-	-	2	2
CO 5	3	3	3	2	2	-	-	1	2	3
CO 6	3	2	2	2	2	-	-	1	1	3

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

*PSOs are to be formulated at institute level.

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Java Programming
Course code	R23CI1604
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	
C L	T L	L L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA			
							Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		Max
4	-	4	1	9	3	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.

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. CO1: Understand Java fundamentals including program structure, data types, operators, and control statements.
2. CO2: Develop Java programs using classes, objects, methods, constructors, and inheritance.
3. CO3: Implement interfaces for multiple inheritance and create and use packages in Java.
4. CO4: Handle exceptions and develop multithreaded Java applications.
5. CO5: Apply collection framework, stream I/O, and file handling techniques in Java programs.
6. CO6: Design GUI applications using AWT/Applets and implement database connectivity using JDBC.

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. 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.	7	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, finalize 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	8	15	CO2

3	3.1 Interfaces: 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	6	10	CO3
4	4.1 Errors 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.	6	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 Interface overview 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, closing a file, reading bytes from a file, storing bytes to a file, random access files, storing and retrieving primitive data to files.	Implementing Collection Framework, use stream I/O, and perform file operations	6	10	CO5

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, .	Design AWT and JDBC programs	7	15	CO6
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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. b. Write programs to use different types of operators and expressions.	LLO 1.1 Install any IDE software application. LLO 1.2 Develop program to use different types of operators and expressions	2	CO1
2.	Write programs to demonstrate use of: if statements (all forms of if statement)	LLO 2.1 Develop program to implement different control structures.	2	CO1
3.	Write programs to demonstrate use of: Switch – Case statement	LLO 2.1 Develop program to implement different control structures.	2	CO1
4.	Write programs to demonstrate use of: Different types of Loops (for, while and do..While).	LLO 2.1 Develop program to implement different control structures.	2	CO1
5.	Write program for implementing methods of: i) String class, ii) String Buffer class	LLO 3.1 Develop program to implement different control structures.	2	CO1

6.	Write programs to demonstrate use of Array	LLO 3.2 Implement array in Java.	2	CO2
7.	Write programs to demonstrate use of Vectors.	LLO 3.2 Implement vectors in Java.	2	CO2
8.	Write a program for implementation of: Method overloading,	LLO 4.1 Implement, method overloading in Java.	2	CO2
9.	Write a program for implementation of: Final variables, methods, classes.	LLO 4.1 Implement, final variables, methods, classes, in Java.	2	CO2
10.	Write a program for implementation of: Dynamic method dispatch	LLO 4.1 Implement dynamic method dispatch in Java.	2	CO2
11.	Write programs using Wrapper Class to convert : Primitive data type into object.	LLO 5.1 Convert primitive data types into object.	2	CO2
12.	Write programs using Wrapper Class to convert : Object into primitive data type.	LLO 5.1 Convert Object into primitive data type.	2	CO2
13.	Develop program for implementation of interface.	LLO 6.1 Implement multiple inheritances.	2	CO3
14.	Write programs to demonstrate use of : Built in packages.	LLO 7.1 Implement packages in Java.	2	CO3
15.	Write programs to demonstrate use of : User defined packages.	LLO 7.1 Implement packages in Java.	2	CO3
16.	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
17.	Write programs using multithreading.	LLO 9.1 Execute different processes simultaneously using multithreading.	2	CO4
18.	Program using Collection interface.	LLO 10.1 Implement Collection interface in Java.	2	CO5
19.	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 11.1 Execute different file operations including reading, writing, copying file content, writing bytes using FileOutputStream, and reading bytes using FileInputStream in Java.	2	CO5
20.	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 6.1 Implement AWT components and event handling to create interactive GUI applications in Java.	2	CO6

21.	Write program to create a menu bar with various menu items and sub menu items.	LLO 6.1 Implement AWT components and event handling to create interactive GUI applications in Java.	2	CO6
22.	Write program to demonstrate the use of border layout. The layout shows four buttons at four sides with captions “left”, “right”, “top” and “bottom” using AWT Components	LLO 6.1Implements Layout managers: Border Layout	2	CO6
23.	Write program to design a calculator to demonstrate the use of grid layout using AWT Components.	LLO 6.1Implements Layout managers: GridLayout	2	CO6
24.	Write a Java program using JDBC to connect to an Any 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

- Marks/Grade Management System (Java – Console Based): Accepts student details and marks via console, calculates total, average, GPA/grade, and displays a report card on the console.
- 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.
- Online Shopping Cart (Mini) Add/remove items to cart, checkout total, apply discount.
- 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 microprojects 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.	7	3	4	3	10
2.	Classes, Objects, Methods, Arrays, Strings and Vectors.	8	3	6	6	15
3.	Interfaces: Multiple Inheritance, Packages.	6	3	4	3	10
4.	Errors and Exception Handling, Multithreading	6	3	4	3	10
5.	Collection Framework Streams And File I/O	6	3	6	6	10
6.	AWT & JDBC	7	3	4	3	15
	Total	40	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**
 - 1) 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, 6 th Edition, 2023
2	# Herbert Schildt	Java Complete Reference – Java 2	Tata McGraw Hill, 7 th Edition, 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 Commons license status and financial implications of the suggested online educational resources before use by the students.

K) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

Name & Signature:

(Programme Head)

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Industrial Management for IT Industry
Course code	R23CI1606
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	
C L	T L	L L					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	

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.

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 and IoT engineering 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 and IoT-driven organizations.

B) EXPECTED SKILL/s –

Students will gain the ability to apply management and organizational principles in IT/IoT projects, 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 and IoT-based 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. Analyze organizational structures, authority systems, and communication practices in IT/IOT 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/IOT projects and services.
5. Apply digital resource, IT asset, inventory control, and sustainable computing practices in IT/IOT organizations.
6. Explain marketing, product life cycle, project management, and ethical practices in the IT/IOT industry.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	Unit I: 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	TLO1.1 Explain the meaning, need, and importance of management in the IT and software industry. TLO1.2 Identify different levels of management in IT organizations and their roles. TLO1.3 Apply management functions (POSDC) to SDLC and Agile-based projects. TLO1.4 Illustrate Fayol's principles of management with suitable IT workplace examples. TLO1.5 Demonstrate leadership, motivation, and confidence-building practices for software professionals. TLO1.6 Interpret the role of data-driven management and dashboards in decision-making	8	15	CO1
2	Unit II: Organization & Work Systems in IOT Companies 1. Concept and importance of organization in IoT solution companies	TLO2.1 Describe organizational concepts used in software and IT companies. TLO2.2 Differentiate	7	10	CO2

	2. Organizational structures in IT industry: ○ Functional ○ Project-based ○ Matrix ○ IOT, Agile / Scrum teams 3. Departmentation in IT organizations 4. Authority, responsibility and accountability in IoT teams 5. Centralized and decentralized decision-making in IoT systems 6. Communication systems in IoT organizations 7. Communication systems in IoT organizations, Field deployment, monitoring and remote operations 8. Professional conduct and teamwork in digital workplaces	between functional, project, matrix, and agile organizational structures. TLO2.3 Explain authority, responsibility, and accountability in IT/IOT project teams. TLO2.4 Compare centralized and decentralized decision-making in digital organizations. TLO2.5 Explain departmentation and communication systems in remote and hybrid IOT teams. TLO2.6 Demonstrate professional conduct and teamwork in digital workplaces.			
3	Unit III: Human Resource Management in IT Sector 1. Meaning, scope and importance of HRM in IOT organizations 2. HRM functions in software companies 3. Manpower planning and recruitment processes in IOT sector. Recruitment and skill requirements: embedded systems, sensors, networking, cloud IoT 4. Training, upskilling and reskilling in emerging IOT technologies 5. Scientific management concepts applied to software productivity 6. Motivation theories and leadership styles for IT/IOT teams 7. Performance appraisal, KPIs and work ethics 8. Wages, incentives and compensation basics in IT industry	TLO3.1 Explain the functions and importance of HRM in software/IOT organizations. TLO3.2 Describe manpower planning and recruitment processes in the IT sector. TLO3.3 Identify training, upskilling, and reskilling needs in emerging IOT technologies. TLO3.4 Apply scientific management concepts to improve software productivity. TLO3.5 Analyze motivation theories and leadership styles applicable to IOT teams. TLO3.6 Explain performance appraisal systems, KPIs, and ethical work practices. TLO3.7 Describe basic wage, incentive, and compensation structures in IOT companies.	8	10	CO3

4	Unit IV: Financial Management & Taxation for IT Projects 1. Concept and importance of financial management for IOT engineers 2. Capital requirements for IOT startups and software projects 3. Budgeting and cost estimation for software development 4. Financial statements of IT firms: - o Profit and Loss Statement - o Balance Sheet 5. Financial ratios – concept and significance 6. Basics of taxation and GST applicable to software services	TLO4.1 Explain financial management concepts relevant to IOT engineers. TLO4.2 Estimate capital and budget requirements for IOT startups and software projects. TLO4.3 Prepare basic cost estimates for software development projects. TLO4.4 Interpret basic financial statements of IT firms such as Profit & Loss Account and Balance Sheet. TLO4.5 Analyze financial ratios for assessing business performance (conceptual level). TLO4.6 Explain taxation basics and GST applicability to software services.	7	10	CO4
5	Unit V: Digital Resource & Asset Management 1. Concept and classification of digital resources and IOT assets 2. IoT asset management: sensors, gateways, embedded boards, cloud platforms 3. Inventory control techniques applied to IoT assets - o ABC analysis - o EOQ - o Just-in-Time (JIT) 4. ERP systems – concept and applications 5. CRM systems – concept and applications 6. Green IoT and sustainable practices	TLO5.1 Explain the concept and classification of digital resources and IT assets. TLO5.2 Manage IOT assets such as software licenses, servers, and cloud resources conceptually. TLO5.3 Apply inventory control techniques (ABC analysis, EOQ, JIT) to IOT assets. TLO5.4 Describe the role of ERP and CRM systems in organizations. TLO5.5 Explain Green IOT practices and sustainable computing concepts.	7	15	CO5
6	Unit VI: IT Marketing, Product & Project Management 1. Marketing management concepts for IT and software products Product life cycle of IoT systems 2. Digital marketing tools and techniques 3. Product life cycle of software applications 4. Project management concepts for IT projects	TLO6.1 Explain marketing concepts for software products and IT services. TLO6.2 Identify digital marketing tools and techniques used in IOT industry. TLO6.3 Describe the product life cycle of software applications. TLO6.4 Explain basic project management concepts and Agile	8	10	CO6

	Project management concepts for IoT projects 5. Overview of Agile methodology 6. Business ethics in IT organizations Overview of Agile and DevOps in IoT 7. Data privacy, cybersecurity awareness and responsible computing Data privacy, cybersecurity and ethical issues in IoT	methodology overview. TLO6.5 Demonstrate awareness of business ethics, data privacy, and responsible computing practices.			
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E) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) –

Following are some suggestive self-learning topics

- **Micro-Projects:** Organizational design, HR recruitment planning, training roadmap, project budgeting, IT asset register, digital marketing plan
- **Activities:** Scrum role-play, Agile case discussions, financial statement analysis, asset classification (ABC), sustainability posters
- **Assignments:** Case studies on decision-making, motivation, remote work, GST, ERP/CRM, ethics and data privacy
- **Industrial Visit:** IT/Software company, startup, ERP/CRM provider or data center with post-visit report
- **Skills Developed:** Organizational understanding, communication, teamwork, leadership, financial literacy, ethical awareness, analytical and industry-ready skills

Note:

Above is just a suggestive list of microprojects 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

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	6	5	15
2	Organization & Work Systems in IOT Companies	7	3	4	3	10
3	Human Resource Management in IT Sector	8	3	3	4	10
4	Financial Management & Taxation for IT Projects	7	3	4	3	10
5	Digital Resource & Asset Management	7	4	6	5	15
6	IT Marketing, Product & Project Management	8	3	4	3	10
		45	20	27	23	70

G) ASSESSMENT TOOL –

- **Formative assessment**
 - Continuous assessment-based term work including assignments, mini-projects, presentations, quizzes, role-play activities, and industrial visit reports.
- **Summative Assessment**
 - End-semester written examination assessing conceptual understanding, application of management principles, problem-solving, and analytical skills in IT/IoT contexts.

H) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	V. S. Pande & B. S. Basak	<i>Industrial Management</i>	Himalaya Publishing House, Mumbai (Classic MSBTE-aligned book covering management, HR, finance, marketing)
2	O. P. Khanna	<i>Industrial Management</i>	Dhanpat Rai Publications (Strong fundamentals, widely accepted in diploma engineering)
3	Raghuram G. Rajan & Julie Wulf (Indian Edition – Selected Topics)	<i>Management Practices</i>	Pearson Education (For organization, leadership, and decision-making basics)
4	Harold Koontz & Heinz Weihrich	<i>Essentials of Management</i>	McGraw-Hill Education
5	Stephen P. Robbins	<i>Organizational Behavior</i>	Pearson Education
6	Gary Dessler	<i>Human Resource Management</i>	Pearson Education
7	K. Aswathappa	<i>Human Resource Management</i>	Tata McGraw-Hill

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

D) CO-PO Matrix –

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

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

Diploma Programme	Computer Engineering & IoT
Course Name	Seminar and Capstone Initiation
Course code	R23CI1605
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	
C L	T L	L L					FA TH	SA - T H	Total		FA-PR		SA-PR		SLA			
									Ma x	M in	Ma x	Mi n	Ma x	Mi n	Ma x	M in		
-	-	2	1	3	1	3	-	-	-	-	25	10	25 @	10	25	10	75	

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

A) RATIONALE

Diploma students often face difficulty in presenting technical ideas confidently and in transforming theoretical knowledge into real-world solutions. The Seminar & Capstone Project Initiation course is designed to bridge this gap by developing research aptitude, communication skills, problem identification ability, project planning skills, teamwork, and professional ethics.

The seminar component enhances students' skills in literature review, academic writing, presentation, and discussion, while project initiation prepares students to identify industry-relevant problems, analyze feasibility, define scope, and prepare an action plan for successful execution of the capstone project in the final semester. This course acts as a foundation for independent learning, innovation, and industry readiness, as expected by MSBTE K-Scheme and employers.

B) COURSE OUTCOMES (COs)

The students will be able to :

CO1Identify relevant seminar topics and real-life problem statements aligned with emerging technologies and industry needs.

CO2:Collect, analyze, and organize authenticated data through literature survey and field study.

CO3:Apply effective presentation, documentation, and communication skills during semina delivery.

CO4:Formulate a feasible and innovative project proposal including objectives, scope, resources, and action plan.

CO5:Demonstrate teamwork, ethical practices, and professional responsibility in seminar and project planning activities.

CO6:Prepare structured technical reports and presentations following MSBTE documentation standards.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	UNIT-1: Orientation to Seminar & Capstone Project 1.1 Importance of seminar and capstone project in diploma education 1.2 Role of seminar in confidence building and professional communication 1.3 Overview of MSBTE K-Scheme requirements 1.4 Industry expectations and employer competencies 1.4.1 Ethics, safety, sustainability, and societal relevance	1a. Understand objectives and structure of seminar and project initiation 1b. Recognize industry-oriented learning expectations 1c. Appreciate professional ethics and responsibility			CO1
	UNIT-2: Seminar Topic Selection & Literature Survey 2.1 Identification of seminar themes	2a. Select appropriate seminar topics aligned with programme			CO2
2	related to emerging technologies 2.2 Criteria for selecting seminar topics 2.3 Sources of information: journals, books, patents, standards, online databases 2.4 Literature review techniques 2.5 Data authenticity and plagiarism awareness	outcomes 2b. Perform structured literature survey 2c. Organize technical information systematically			

3	UNIT-3: Seminar Preparation, Documentation & Presentation 3.1 Seminar paper structure (abstract, introduction, review, conclusion) 3.2 Technical report formatting as per MSBTE guidelines 3.3 PPT preparation using appropriate software tools 3.4 Presentation skills: body language, time management, Q&A handling 3.4.1 Evaluation criteria and rubrics	3a. Prepare technically sound seminar reports 3b. Deliver seminar confidently using effective presentation techniques 3c. Respond appropriately to questions and discussions			CO3
4	UNIT-4: Project Problem Identification & Feasibility Analysis 4.1 Identification of real-world / industry-based problem statements 4.2 Project theme selection (individual & group) 4.3 Scope definition and objectives formulation 4.4 Feasibility analysis: technical, financial, operational, and time feasibility 4.4.1 Stakeholder identification	4a. Identify innovative and feasible project problems 4b. Define project scope and measurable objectives 4c. Analyze feasibility and constraints			CO4
5	UNIT-5: Project Planning & Action Plan Development 5.1 Team formation and role allocation Work Breakdown Structure (WBS) 5.2 Project scheduling and milestones 5.3 Resource planning (tools, software, materials) 5.4 Risk identification and mitigation strategies	5a. Develop structured project execution plans 5b. Work collaboratively in teams 5c. Prepare realistic action plans and timelines			CO5
6	UNIT-6: Project Proposal, Documentation & Review 6.1 Project proposal preparation 6.2 Documentation standards for project Initiation 6.3 Project diary and progress monitoring 6.4 Internal review and feedback incorporation 6.5 Readiness for Capstone Project execution	6a. Prepare complete project initiation documents 6b. Maintain project records and reports 6c. Demonstrate preparedness for final capstone project			CO6

D) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC in Charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-411001

Diploma Programme	Computer Engineering & IoT
Course Name	AI Tools and Techniques
Course code	R23CI6606
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	Min	Max	Min	Max	Min	Max	Min		
2	-	4	-	6	3	-	-	-	-	-	-	50	20	25@	10	-	-	75

Total IKS Hrs for Sem.:40 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.

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

A) RATIONALE

This course introduces fundamental concepts of Artificial Intelligence and its evolution. It enables learners to understand different types of AI and their real-world applications. The course develops practical skills in using modern AI tools, language models, and generative AI platforms.

It enhances productivity through AI-assisted research, writing, automation, and data analysis tools. Learners gain hands-on experience with cloud-based AI services and model deployment.

The course promotes ethical, responsible, and secure use of Artificial Intelligence. It prepares students to design and implement basic AI applications and mini projects for industry use.

B) COURSE OUTCOMES(COs)

The students will be able to

CO1 Understand basics of AI, its types, applications, and AI tools.

CO2 Apply prompting techniques using language AI tools ethically.

CO3 Use AI tools for research, writing, and productivity tasks.

CO4 Create generative media and AI applications using modern tools.

CO5 Deploy AI solutions using cloud-based AI platforms.

CO6 Analyse industry AI applications and develop a mini project with ethical considerations.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	Unit1: 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 1.6 Categories of AI Tools: ML, NLP, CV, Automation, Analytics, Generative AI	UOI.1.1: Define Artificial Intelligence and explain its evolution. UO1.2: Distinguish between ANI, AGI, and ASI. UO1.3: Identify applications of AI in industry. UO1.4: Classify AI tools based on functionality and benefits.	5		CO1
2	Unit2: 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 5 Google Gemini for research and writing	UO2.1: Understand Prompt mind set and fundamentals. UO2.2: Apply zero- shot, few-shot, and role-based prompting techniques. UO2.3: Use ChatGPT and Google Gemini for coding, content, And research. UO2.4: Demonstrate Ethical and Responsible use of Language AI tools.	5		CO2
	Unit3: Research, Writing&	UO3.1: Use AI tools	3		CO3

3	Productivity AI 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	for research and summarization. UO3.2:Apply A I - Assisted writing tools for content improvement. UO3.3: Utilize AI copilots for productivity and collaboration. UO3.4: Organize documentation and planning using AI tools.			
4	Unit4:Generative Media AI Tools 4.1 AI PPT makers and presentation automation 4.2 Image generation fundamentals 4.3 Video generation basics 4.4 AI models and APIs 4.5 No-code/low-code AI automation 4.6 Fast and uncensored AI inference 4.7 AI app building using Lovable (prompt-to-app development)	UO4.1: Create presentations using AI automation tools. UO4.2: Generate images and videos using generative AI. UO4.3: Understand AI models, APIs ,and automation platforms. UO4.4: Build simple AI applications using no-code / low-code tools.	6		CO4
5	Unit5: Cloud-Based AI Tools 5.1 Introduction to Cloud AI 5.2 Google Cloud AI &Vertex AI 5.3 Microsoft Azure AI Services 5.4 AWSAI/ML–Amazon SageMaker 5.5 AI APIs: Vision, Speech, Translation 5.6 Deploying AI models in the cloud 5.7 Industry case studies	UO5.1:Explain the concept of cloud- based AI. UO5.2: Use Google Cloud AI, Azure AI, and AWS AI services. UO5.3: Apply AI APIs for vision, speech, and translation tasks. UO5.4:Deploy AI Models on cloud platforms.	5		CO5
	Unit6: Industry Applications, Ethics& Mini Project 6.1 AI tools used in healthcare,	UO6.1:Analyze AI Applications in healthcare, education, And business.			

6	education, and business 6.2 AI-based promotion techniques 6.3 Content repurposing and growth strategies 6.4 Ethics, privacy, and responsible AI 6.5 Future trends: Agentic AI, autonomous systems 6.6 Mini Project/Case Study using AI tools	UO6.2: Apply AI tools for promotion and content growth. UO6.3: Explain ethical, privacy, and responsible AI practices. UO6.4: Develop a mini project or case study using AI tools.	6		CO6
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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.	To understand basic concepts of Artificial intelligent and identify commonly used AI tools.	LLO1.1 Explain basic concepts of Artificial Intelligence and its evolution	2	CO1
2.	To identify and differentiate between ANI, AGI, and ASI with examples	LLO 1.3 Differentiate between types of AI such as ANI, AGI, and ASI.	2	CO1
3.	Design a zero-shot prompt to generate a professional email without providing examples	LLO 2.1 Apply zero-shot prompting techniques to generate AI responses	2	CO2
4.	To apply few-shot prompting for better AI responses.	LLO2.2 Apply few-shot prompting techniques to generate AI Responses	2	CO2
5.	Use role-based prompting to simulate a teacher explaining AI ethics to beginners.	LLO 2.2 Design role-based prompts for specific use case using language AI tools.	2	CO2
6.	Modify a prompt to eliminate bias and generate responsible AI responses.	LLO 2.4: Demonstrate ethical and responsible AI usage by identifying and reducing bias in prompts.	2	CO2
7.	Debug a Python program using AI-assisted code suggestions	LLO2.5: Use AI language tools to analyze, debug, and improve program code.	2	CO2
8.	Build a simple To-Do web app with add, delete, and local storage using Cursor AI.	LLO2.6: Develop a basic web application using AI-assisted Coding tools.	2	CO3

9.	Research and summarize future trends in Agentic AI with references	LLO2.7:Use AI tools responsibly to research, summarize, and reference emerging AI trends.	2	CO3
10.	To summarize a topic or research paper using Perplexity AI.	LLO3.1UseAItoolsforresearch, summarization, and information verification.	2	CO3
11.	Improve grammar and paraphrase an academic paragraph using AI tools	LLO3.2:Apply AI-assisted writing tools to enhance grammar, clarity, and paraphrasing	2	CO3
12.	Analyze as ales data stein Excel using natural language prompts.	LLO3.3:Analyze datasets using AI-powered natural language features in productivity tools.	2	CO4
13.	To create project documentation or planning notes using Notion AI.	LLO 3.4: Create structured documentation and project plans using AI assistants.	2	CO4
14.	To create an AI- powered presentation using Gamma App.	LLO 4.1 Create AI-generated presentation using generative AI tools.	2	CO4
15.	To generate images using Kling AI or Nano Banana Pro.	LLO 4.2 Create AI-generated images using generative AI tools	2	CO4
16.	To create a short AI-generated video using Veo or WAN.	LLO 4.3 Create AI-generated videos using generative AI tools	2	CO5
17.	To automate a simple AI work flow using n8n	LLO O 4.4 Develop simple AI based work flows using low-code or no-code automation tools	2	CO5
18.	To generate images from text prompts using OpenAI API.	LLO 4.5 Generate multimedia content from text prompts using AI models and APIs.	2	CO5
19.	Develop a simple AI web application using prompt to-app generation	LLO 4.6: Build simple AI applications using prompt-to-app development platforms.	2	CO5
20.	Create a multimodal output combining text and OpenAI API image generation.	LLO4.7: Create multimodal AI outputs by integrating text and image generation models.	2	CO5
21.	Perform text translation using Google Cloud AI free tier services.	LLO5.1:Usecloud-basedAI APIs for translation and language processing tasks.	2	CO5

22.	Deploy a pre-trained machine learning model on Vertex AI.	LLO 5.2 Use cloud-based AI services for tasks such as sentiment analysis or image classification.	2	CO5
23.	Conduct sentiment analysis using Azure Cognitive Services.	LLO5.3: Apply cloud-based AI services for sentiment analysis tasks.	2	CO5
24.	Train and evaluate a basic machine learning model using AWS Sage Maker.	LLO6.1Design, implement ,and present an AI mini project or case study	2	CO5
25	Deploy an AI chatbot application using a web framework.	LLO6.2: Design,implement, and deploy an AI-based chatbot application.	2	CO6

D) 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	AI TOOLS	ALL

E) 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 AI & AI Tools	5	-	-	-	-
2.	Prompting & Language AI Tools	5	-	-	-	-
3.	Research, Writing & Productivity AI	3	-	-	-	-
4.	Generative Media AI Tools	6	-	-	-	-
5.	Cloud-Based AI Tools	5	-	-	-	-
6.	Industry Applications, Ethics& Mini Project	6	-	-	-	-
		30				

ASSESSMENT TOOL–

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

F) LEARNING RESOURCES–

• BOOKS

Sr.No.	Author	Title	Publisher with ISBN Number
1	Stuart Russell, Peter Norvig	Artificial Intelligence: A Modern Approach	Pearson Education, ISBN:978-0134610993
2	Tom Taulli	Artificial Intelligence Basics: A Non-Technical Introduction	A press, ISBN:978-1484235157
3	Rajaling Shanmugamani	Hands-On Artificial Intelligence with Python	Packt Publishing, ISBN:978-1788993093
4	Bernard Marr	Artificial Intelligence in Practice	Wiley, ISBN:978-1119542280

• WEBSITES LINKS

Sr.No.	Link/Portal
1	Open AI 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

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

G)CO-PO Matrix–

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

Name & Signature	
(Courses Expert)	
Name & Signature	Name & Signature
(Programme Head)	(CDC in Charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Software Testing tools and Automation
Course code	R23CI6607
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				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	Min	Max	Min	Max	Min	Max	Min	
-	-	2	-	2	1	-	-	-	-	-	50	20	-	-	-	-	50

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

A) RATIONALE

This course is designed to provide fundamental and advanced knowledge of software testing and automation tools used in modern IT industries. It focuses on both manual and automated testing techniques, enabling students to understand Software Testing Life Cycle (STLC), Selenium automation, version control systems, and test management tools like Tosca.

The syllabus emphasizes practical implementation of testing concepts, integration with real-world tools (Selenium, Git, Maven, TestNG, Tosca), and exposure to industry-standard practices such as cross-browser testing, data-driven testing, and test case design.

B) EXPECTED SKILL/s –

After completing this course, students will be able to:

- Perform manual and automated testing on web applications
- Use Selenium WebDriver for automation testing
- Apply different testing techniques (functional, regression, smoke, sanity)

- Design and execute test cases and test scripts
- Handle dynamic web elements, alerts, frames, and synchronization
- Use TestNG framework for test execution and reporting
- Implement Page Object Model (POM) for scalable automation
- Use Git and GitHub for version control
- Manage projects using Maven dependencies
- Perform model-based testing using Tosca
- Analyze test results and generate reports
- Work effectively in team-based and Agile environments

C) COURSE OUTCOMES (COs)

Students will be able to -

1. Understand and apply basic software testing concepts, STLC, and types of testing in real-world scenarios.
2. Develop and execute automation scripts using Selenium WebDriver with appropriate locators and browser operations.
3. Apply advanced Selenium concepts such as synchronization, TestNG framework, and Page Object Model for efficient automation.
4. Use version control tools (Git, GitHub) and build tools (Maven) for managing automation projects.
5. Understand and implement test design techniques and automation using Tosca, including model-based testing.
6. Create, execute, and analyze **test cases**, generate reports, and interpret testing results for quality assurance.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	UNIT 1: Introduction to Software Testing & Automation • Introduction to Software Testing • Objectives and importance of testing • Manual Testing vs Automation Testing • Software Development Life Cycle (SDLC) • Software Testing Life Cycle (STLC) • Types of Testing - o Functional Testing - o Regression Testing - o Smoke Testing - o Sanity Testing • Need and benefits of Automation Testing • Overview of Selenium Tool and its components	TLO 1: Explain software testing concepts and importance. TLO 2: Describe SDLC and STLC TLO 3 : Identify types of testing	-	-	CO1
2	UNIT 2: Selenium WebDriver Fundamentals • Selenium Architecture	TLO 1: Explain Selenium architecture and WebDriver TLO 2: Setup WebDriver	-	-	CO2

	• Selenium WebDriver Overview • WebDriver Setup and Configuration • Browser Drivers ◦ Chrome Driver ◦ Cross-Browser Testing concepts • Locators in Selenium ◦ ID ◦ Name ◦ Class Name ◦ XPath (Absolute & Relative) ◦ CSS Selectors • Browser Navigation Commands ◦ get(), navigate(), back(), forward(), refresh()	and browser drivers TLO 3: Identify different locators (ID, Name, XPath, CSS)			
3	UNIT 3: Advanced Selenium Concepts Synchronization in Selenium Implicit Wait and Explicit Wait Handling JavaScript Alerts Handling Frames and Windows Data-Driven Testing Concepts TestNG Framework TestNG annotations Test execution flow Introduction to Page Object Model (POM)	TLO 1: Explain synchronization in Selenium TLO 2: Apply implicit and explicit wait TLO 3: Handle alerts, frames, and windows TLO 4: Explain data-driven testing concept TLO 5: Use TestNG framework basics	-	-	CO3
4	UNIT 4: Project & Version Control Introduction to Version Control Systems Git Basics ◦ Repository ◦ Commit ◦ Branch ◦ Merge • GitHub Overview • Maven Project Structure • Dependency Management using Maven • Test Report Generation Concepts	TLO 1: Explain version control concepts TLO 2: Describe Git basics (repository, commit, branch, merge) TLO 3: Explain GitHub usage TLO 4: Describe Maven project structure TLO 5: Explain dependency management and test reporting	-	-	CO4
5	UNIT 5: Introduction to Tosca & Test Design Fundamentals Overview of Tricentis Tosca Automation testing concepts Model-Based Test Automation (MBTA) Tosca Architecture and Components	TLO1 : Explain Tosca concepts and architecture TLO 2: Describe Tosca workspace and modules TLO 3: Explain model-based test automation (MBTA)	-	-	CO5

	Tosca Commander Interface Tosca Workspace and Project Structure Tosca Modules Standard Modules Reusable Modules Scanning Applications (Web) Test Case Design Approach Business-based test design Reusability and maintenance concepts	TLO 4: Perform application scanning in Tosca TLO 5: Explain test case design approach TLO 6: Understand reusability and maintenance concepts			
6	UNIT 6: Test Case Creation, Execution & Result Analysis • Test Step Configuration • Test Case Creation Techniques • Test Case Execution Concepts • Execution Lists • Test Execution Flow • Test Result Analysis • Logs and Reporting in Tosca	TLO 1: Explain test case creation techniques TLO 2: Configure test steps TLO 3: Perform test case execution TLO 4: Explain execution flow and lists TLO 5: Analyze test results and logs TLO 6: Generate reports	-	-	CO6

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

SR.No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1	1	Study and Setup of Selenium IDE Environment for Automated Web Testing	2
2	1	Design a Web Application and Perform Manual Testing for Defined Test Cases	2
3	1	To perform functional testing on a web application and verify expected functionality.	2
4	1,6	To perform smoke testing to verify the basic stability of the application.	2
5	1,2	Perform Sanity testing to verify specific functionalities after minor changes.	2
6	1,2	Perform regression testing to ensure that existing functionalities are not affected by any changes.	2
7	3	Implement synchronization using Implicit Wait and Explicit wait.	2
8		Handling Javascript Alerts in selenium.	2
9	4	Installation and Configuration of Git using Git commands.	2
10	5	Create a new repository and perform basic Git operations like add, commit, and view history.	2
11	3,5	Create a project using Apache Maven and understand its structure.	2
12	3	Execute automated test cases using TestNG and generate test reports.	2

F) SELF LEARNING ASSESMENT ACTIVITIES (MINI PROJECT, ASSIGNMENTS / SPECIFIC LEARNING ACTIVITIES / SKILLS DEVELOPMENT (SELF LEARNING)) – Not Applicable

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	Selenium IDE, Git Hub	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 Testing & Automation	-	-	-	-	-
2	Selenium WebDriver Fundamentals	-	-	-	-	-
3	Advanced Selenium Concepts	-	-	-	-	-
4	Project & Version Control	-	-	-	-	-
5	Introduction to Tosca & Test Design Fundamentals	-	-	-	-	-
6	Test Case Creation, Execution & Result Analysis	-	-	-	-	-

I) ASSESMENT TOOL –

- **Formative assessment**
 - Continuous assessment-based term work including assignments, mini-projects, presentations, quizzes, role-play activities, and industrial visit reports.

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Author	Title	Publisher with ISBN Number
1	Glenford J. Myers, Tom Badgett, Corey Sandler	The Art of Software Testing	John Wiley & Sons
2	Ron Patton	Software Testing	Sams Publishing
3	Unmesh Gundecha	Selenium Testing Tools	Packt Publishing Ltd

Sr.No.	Author	Title	Publisher with ISBN Number
		Cookbook	
4	Narayanan Palani	Software Automation Testing Secrets Revealed	Educreation Publishing

• WEBSITES LINKS

Sr.No.	Link / Portal
1	https://www.softwaretestingmaterial.com/selenium-tutorial
2	https://www.selenium-tutorial.com
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	-
CO2	3	2	2	2	-	-	-	1	-	-
CO3	3	3	2	2	-	-	-	1	1	-
CO4	2	2	2	2	-	-	1	1	1	1
CO5	2	2	2	2	-	-	1	-	1	1
CO6	2	3	2	3	1	2	2	1	2	2

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering and IoT
Course Name	Engineering Workshop Practice
Course code	R23CI6601
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
C L	T L	L L					FA TH	SA- TH	Total		FA-PR		SA-PR		SLA		
									Max	Min	Max	Min	Max	Min	Max	Min	
-	-	4	-	4	2	-	-	-	-	50	20	50@	20	-	-	100	

Abbreviations:

Total IKS Hrs for Sem.: 0 Hrs

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

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.

B) 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.

C) 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.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
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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	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 cable's 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	2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22
14	External Hard Disk(500 GB/1 TB)	15

15	Light vacuum cleaner, approx. 200 watts with brushes and accessories	2,3,9
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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, 2014 ISBN: 978-81-203-4798-4
2	Minasi, Mark	The Complete PC Upgrade And maintenance Guide	BPB Publication, New Delhi ISBN:978-81-265-0627-9
3	Kadam, Sachin	Computer Architecture and Maintenance Vol.1	Shroff Publication, Mumbai ISBN: 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=4 Essential 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 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	-	3	-	-	-	1	-	-
CO2	1	-	-	2	-	-	-	1	-	-
CO3	1	-	-	2	-	-	1	1	-	-
CO4	1	-	-	2	-	-	1	1	-	-
CO5	1	1	1	2	-	-	-	1	-	-
CO6	1	2	1	2	-	-	-	1	-	-
Legends :- High:03, Medium:02, Low:01										

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering and IoT
Course Name	Fundamentals of ICT
Course code	R23CI6602
Course Category	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	
C L	T L	L L					FA TH	SA- TH	Total		FA-PR		SA-PR		SLA			
									Max	Min	Max	Min	Max	Min	Max	Min		
2	-	2	2	6	3		-	-	-	-	50	20	25@	10	25	10	100	

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.

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 and use of computer system, storage devices and its peripherals.

CO2 –Know the concepts, types of operating systems and use of application softwares.

CO3- Use Word Processing Tool for preparing documents.

CO4 - Use Spreadsheet for Analyzing Data and representing it graphically.

CO5 - Prepare presentations using Power point

CO6 - - Use various DOS commands, different Web Browsers, browsing of Internet, concept 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.	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 1.3 Understand and describe the different types of output devices.	2	Hands-on Demonstration Presentations

		Introduction to -Digital Camera, Voice Recognition System. Media Input Devices- Microphone, Webcam, Graphics tablet			
2	Unit II 2.1 Computer Software and Operating Systems 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 2.4 Exposure to Windows OS: Introduction, Desktop (taskbar, customizing taskbar, desktop, customizing desktop), My Computer, My Documents, My Network Places, Recycle Bin, Windows Explorer. Files and Folders- creation, moving, copying, renaming, deleting, searching .	TLO 2.1 Classify the given type of software TLO 2.2 Understand the components of Windows O.S TLO 2.3 Describe procedure to manage a file / folder in the given way	2	Hands-on Demonstration Presentations	
3	Unit - III Word Processing 3.1 Word Processing: Overview of Word processor Basics of Font type, size,	TLO 3.1 Write steps to create the given text document. TLO 3.2 Explain the given	3	Hands-on Demonstration Presentations	

		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 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	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			
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		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, S 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 Sorting,	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.	3	Hands-on Demonstration Presentations

		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, 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	3	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, chkdisk, and help. 6.2 Network environments: network interface cards, hubs, switches, routers and	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.	2	Hands-on Demonstration Presentations	

	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 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	TLO 6.6 Explain concepts and applications of emerging technologies TLO 6.7 Use various elementary cloud-based tools.			
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E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Sr. No.	Laboratory Experiment/Practical Titles/Tutorial Titles	Practical/Tutorial/Laboratory Learning Outcome(LL O)	Number of Hrs	Relevant COs.
1.	a) Work with Computer System, Input/Output devices, and peripherals. b) Work with files and folders.	LLO1.1Identifyvarious Input/output devices, connections and peripherals of computer system LLO1.2Work with Computer System, Input/output devices ,and peripherals for manages files and folders for data	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 LLO 7.2 Apply various functions and named ranges in worksheet.	2	CO3
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	2	CO4

			slide LLO 11.3 Use pictures text/images/shapes editing options.		
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

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

Self Learning

Following are some suggestive self-learning topics:

- 1) Use ChatGPT/any other AI tool to explore information.
- 2) Use Calendar to Schedule and edit activities.
- 3) Use Translate app to translate the given content from one language to another.
- 4) Use cloud based storage drive to store and share your files.

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) Perform a survey on various input and output devices available in market and make its report.
- 2) 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)
- 3) 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).
- 4) Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student).
- 5) Carry-out Survey on different web browsers.
- 6) Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

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	2	0	0	0	0
2	II	Computer Software and Operating Systems	CO2	2	0	0	0	0
3	III	Word Processing	CO3	3	0	0	0	0
4	IV	Spreadsheets	CO4	3	0	0	0	0
5	V	Presentation Tool	CO5	3	0	0	0	0
6	VI	Basics of DOS, Network , Internet and Emerging Technologies	CO6	2	0	0	0	0
Grand Total				15	0	0	0	0

I) ASSESMENT TOOL –**1) Formative assessment (Assessment for Learning)**

Lab performance, Assignment, Self-learning and Seminar/Presentation

2) Summative Assessment (Assessment of Learning)

Lab. Performance, viva voce

- **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>

F) 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	3	2	-	-	2	-	-	3	-	-
CO2	3	2	2	-	2	-	-	2	1	-
CO3	2	-	2	-	3	-	-	-	2	2
CO4	2	3	2	2	3	-	-	-	2	2
CO5	2	-	2	-	3	1	-	-	2	2
CO6	2	2	2	2	3	2	2	2	3	2

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering and IoT
Course Name	Web Page Design
Course code	R23CI6603
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		
C L	T L	L L					FA TH		SA-TH		Total		FA-PR		SA-PR			SLA	
							Max	Min	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

A) RATIONALE

Web page design provides a platform to express digital world. The course combines creative and technical skills to develop online platform such as web sites. This course introduces web page design using HTML5 and also 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)

Course Outcomes:

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.

C) 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 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 Block Level Elements: Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, types of Address, HR tag. Horizontal Rule. 1.4 Text Level Tags: Bold, em, Italic, Teletype, Underline, Strikethrough, Superscript, Subscript, DIV tag, displaying special characters, comments.	TLO 1.1 Differentiate Characteristics of the given type of web sites. TLO 1.2 State structure of the given HTML page. TLO 1.3 Explain use of Head tag and body tag in the given web page. TLO 1.4 Explain the procedure of using the given block level tag on a web page. TLO 1.5 Write the procedure of using 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 Web Pages. TLO 2.2 Enlist different types of Links.	5		CO2
3	Multimedia Elements 3.1 Text and Image: Color values, Color attribute of font tag, bgcolor, 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 web page and describe HSPACE & VSPACE TLO 3.2 Explain process of using the given colors/images as page background 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, back ground, and align, width, no wrap, cellspacing, cellheight, cell padding. 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 , textarea, select button, fieldset, legend, datalist, Password field, Radio buttons, Checkboxes, Reset and submit buttons.	TLO 4.1 Explain the given table attributes to organize data on a web page and table setting. TLO 4.2 Enlist different types of table attributes. 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
5	HTML Styles 5.1Cascading Style Sheets(CSS): Different types of CSS- Inline, Internal, External, Benefits of using CSS, Setting CSS properties- Font, text, color, size, border, margin, Linking to CSS. 5.2 CSS Advanced: CSS Rounded Corners ,CSS Border Images, CSS Shadows, CSS Text Effects, CSS 2D Transforms, CSS 3D Transforms, CSS Transitions, CSS Animations, CSS Tooltips, CSS Style Images, CSS Image Reflection. 5.3 CSS Responsive: RWD Intro, RWD Viewport, RWDGrid 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 presentation scheme on a web page. TLO 5.3 Enlist different CSS advanced properties. TLO 5.4 State different types of CSS responsive attributes.	6	CO5
6	Web Site Designing Tools 6.1 Open Source Tools: Photoshop-Image editing, painting with Photoshop, Adobe XP, and Procreate. 6.2 Website Hosting: HTTP - introduction ,method, error codes, Web site Hosting - Basics, name servers, publishing websites, web site maintenance.	TLO 6.1 Explain the procedure to configure a web server and hosting the given website.	4	CO6

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

Sr. No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	*Work with basic HTML tags.	2	CO1
2	*Work on paragraph in webpage	4	CO1
3	*Implement the border properties in web page.	2	CO1
4	*Work with ordered and unordered List.	2	CO2
5	*Work on HTML web page link.	4	CO2
6	*Use of links in web page.	2	CO2
7	*Insert image on web page foreground and background with various attributes	2	CO3
8	*Insert image with hyperlink and set image width and height property of image.	2	CO3
9	*Work on multimedia elements.	2	CO3
10	*Work on HTML table in web page.	2	CO4
11	*Create table within table and insert images in tables.	2	CO4

Sr No	Laboratory Experiment /Practical Titles / Tutorial Titles	Number of hrs.	Relevant Cos
12	*Work with frame tags	2	CO4
13	*Create different elements in web page	4	CO4
14	*Create a CSS by applying style sheets.	4	CO5
15	*Work on RWD (Responsive Web Design) templates in HTML	4	CO5
16	*Work on Photoshop	4	CO6
17	*Image editing on open source tools.	4	CO6
18	*Hosting of website on open source platform	4	CO6
19	*Create a web site to represent portfolio	4	CO6
20	*Integration of various tags, links, forms.	6	CO6
Note: Out of above suggestive LLOs- *'Marked Practicals (LLOs) 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			
E) SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING /SKILLS DEVELOPMENT (SELF LEARNING) Assignment --- 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

F) LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

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

G) 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 HTML	CO1	5	0	0	0	0
2	II	Lists and Links	CO2	5	0	0	0	0
3	III	Images, Colors 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	0	0	0	0

ASSESSMENT METHODOLOGY TOOLS

• Formative Assessment

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

• Summative Assessment (Assessment of Learning)

End of Term Examination (Lab. performance), Viva-voce

SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No.	Title	Author	Publisher with ISBN Number
1	HTML and CSS Complete Reference	Thomos Powell	Tata McGraw Hill ,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.	HTML5 BLACK 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 Stylesheet , CSS Advanced

SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Program Outcomes (POs)							Program 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	3	2	2	1	2	-	-	-	3	1
CO2	2	2	2	1	2	-	-	-	3	1
CO3	2	2	3	2	3	1	-	-	3	1
CO4	2	3	3	2	2	-	-	-	3	1
CO5	3	2	3	1	3	-	-	-	3	2
CO6	2	2	2	3	3	1	1	1	3	2
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

Name & Signature:

(Course Experts)

Name & Signature

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1

Diploma Programme	Computer Engineering And IoT
Course Name	Professional Communication
Course Code	R23CI6701
Course Category	SEC
Credits	1

LEARNING AND ASSESSMENT SCHEME:

Learning Scheme					Credits	Paper Duration (Hrs)	Assessment Scheme										
							Theory				Practical (Based on LL & TL)				Based on Self Learning		Total Marks
Contact Hrs/ Week			Self Learning (Term Work + Assignment)	Notional Learning Hrs / Week			FA - TH	SA - TH	Total	FA - PR		SA - PR		SLA		50	
CL	TL	LL								Max	Max	Max	Min	Max	Min		Max
-	-	02	-	02	01	-	-	-	-	25@	10@	25@	10@	-	-		

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:

- Communicate effectively in various formal and informal situations minimizing the barriers.
- Develop listening skills through active listening and note taking.
- Face a mock interview.
- Draft enquiry letter, complaint letter, Job application with resume / CV
- Write a leave application, request and apology letter.

D) COURSE CONTENTS:

Unit No.	Topics And Subtopics	Learning Outcome (LO's)	CL Hrs/ Week	FA-TH Marks	CO
1	UNIT NO. 1 Professional Communication : An Overview Definition of professional communication- Importance, relevance, Elements and process of communication 7 C's of Professional Communication (Clarity, Conciseness, correctness, Coherent, concrete, courteous and Complete) Effective professional Presentation Skills for business	1.1 Use different types of verbal and non-verbal communication during a presentation	-	-	CO1
2	UNIT NO. 2 – Listening & Note Taking Difference between listening & Hearing Types of listening Active listening Passive listening Selective listening Techniques of Note taking , Types of note taking (Outline notes, Mind Mapping, Flowcharts)	state the difference between listening and hearing Explain active listening, passive listening and selective listening Take notes using appropriate methods	-	-	CO2
3	UNIT NO. 3 – Interview Techniques Preparation stage: Preparing for an interview, pre-interview research. Factors affecting performance during the interview: stress, self-awareness, presence of mind. Post-interview follow-up	3.1 Face a mock interview using appropriate communication skills	-	-	CO3
4	UNIT NO. 4 – Writing Skills-1 Enquiry letter Complaint letter	4.1 Draft formal letters related to employment in given situations.	-	-	CO4
5	UNIT NO. 5 – Writing Skills-2 Letter of job application Resume writing	5.1 Draft formal letters related to employment in given situations.	-	-	CO4
6	UNIT NO. 6 – Writing Skills-3 Leave application Apology letter 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

LABORATORY LEARNING EQUIPMENTS REQUIRED

Language laboratory with latest software

LCD –Projector

Smart Board

SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE:

(Specification Table) NOT APPLICABLE

ASSESSMENT TOOL

Formative assessment

FA-PR (Term Work)

Summative Assessment

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

G) CO-PO MATRIX

	PO 1 Basic & discipline specific knowledge	PO 2 Probl em Analy sis	PO 3 Design/dev el opment of solutions	PO 4 Engineerin g Tools	PO 5 Engineering practice f or society, sustainability and environment.	PO 6 Project manag em ent	PO7 Lifelo ng learni ng
CO1	0	1	0	0	1	1	0
CO2	0	0	0	0	0	1	0
CO3	0	0	0	0	0	1	0
CO4	0	0	0	0	0	1	0
CO5	0	0	0	0	0	1	0

Rating scale '3' for high, '2' for medium, '1' for low '0' for no correlation

H) LEARNING RESOURCES

A) 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	Audiobook -ISBN 978181667009742
5	English for Technical Communication	N P Sudharshana , C Savitha	Cambridge-ISBN 978-13-16640-08-1

S. N.	Title of Book	Author	Publication
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

B) SOFTWARES/TOOLS/MODELS

- Latest online resources, apps etc.
- Language laboratory resources.

C) 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.stornory.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/

Name and Signature	
(Courses Expert)	
Name and Signature	Name and Signature
Programme Head	CDC In-charge

Diploma Programme	Computer Engineering & IoT
Course Name	Object Oriented Programming With C++
Course code	R23CI6604
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	
C L	T L	L L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA			
									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	

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.

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @\$ 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, VC++.

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 1.1 Object Oriented Programming Paradigm, Basic concepts of OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP and Procedure Oriented Programming (POP) verses Object Oriented Programming (OOP). 1.2 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, cascading of I/O operators, Structure of C++ program. 1.3 Tokens: Tokens, keywords, identifiers and constants, Data types- basic datatypes, derived datatypes, 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.	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

	Static data members,Static member functions, array of Objects, Objects as function arguments, friendly functions, returning objects, const member functions.					
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	4.1 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++ streams classes. 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	TLO 6.1 Implement I/O basic 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.	8	10	CO6	

3

	operations.				
	Opening and closing 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	.			

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 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.
- If the course doesn't have associated SLA component, above suggestive listings is applicable to Tutorials and may be 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
		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**
 - 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
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 Matrix –

COURSE OUTCOMES	PROGRAM OUTCOMES							PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO	PSO	PSO 3
CO 1	3	2	1	-	2	-	-	1	1	2
CO 2	3	2	2	-	2	-	-	-	1	2
CO 3	3	2	2	1	2	-	-	-	2	2
CO 4	3	3	3	2	2	-	-	1	2	2
CO 5	3	3	3	2	2	-	-	1	2	3
CO 6	3	2	2	2	2	-	-	1	2	3

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

*PSOs are to be formulated at institute level.

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

Diploma Programme	Computer Engineering and IoT
Course Name	Entrepreneurship Development & Marketing Management
Course code	R23CI6405
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	
C L	T L	L L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA			
									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 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):

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

CO1: Understand the fundamental concepts of entrepreneurship, motivation, creativity, and innovation to develop entrepreneurial competencies and problem-solving skills.

CO2: Develop the ability to identify, evaluate, and analyse business opportunities and ideas using market research and SWOT analysis.

CO3: Gain knowledge of government and non-government support for entrepreneurship and develop skills in business plan preparation and financial analysis.

CO4: Develop an understanding of marketing management principles, consumer behaviour, and market strategies for effective business decision-making.

CO5: Develop strategic marketing skills in pricing, branding, market planning, and international market entry.

CO6: Gain expertise in digital marketing strategies, including SEO, SEM, content marketing, social media, and AI-driven business solutions.

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 1: Introduction and Entrepreneurial Competencies 1.1 Introduction: 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. Need for and importance of achievement motivation, challenges of motivation, Motivating factors. In Brief- theories of motivation 1.3 Creativity and Innovation: Definition and concept of Innovation, definition and concept of Creativity. Characteristics of creative people, Discussion of various examples with respect to creativity and innovation.	1.1 Explain the concept of entrepreneur and entrepreneurship. 1.2 State characteristics and qualities of entrepreneur. 1.3. Difference between Entrepreneur and Intrapreneur. 1.4 Explain the concept of motivation and types of motivation. 1.5. Explain challenges of motivations. 1.6 Explain theories of motivations.	6		CO1
2	Unit 2: Business Opportunity Identification and Idea Development 2.1 Business Opportunity Search and Scanning: Opportunities available	2.1 Explain the concept of Innovation and Creativity. 2.2. Discuss Characteristics of creative people. 23. Discuss various examples of innovation and			

	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. Trade, fair and exhibitions. Checklists for information collection	Creativity. 2.4 Discuss Business Opportunities, 2.5 Describe classification of opportunities. 2.6. Explain search and generation of business ideas. 2.7. Discuss Sources of Business Ideas,	5		CO2	
3	Unit 3: Government Support, Funding, and Business Plan Development 3.1 Government and Non-government Agencies for Promotion funds Development: Importance of funds, Types of funds. Various schemes of assistance of the government, Government policies and incentives. Registration with various government agencies, definition of SSI and Ancillary. 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. and Institutionalized Non institutionalized sources of working capital, Funds flow statements, Loan application form for appraisal. Project report preparation.	3.1 Discuss Government and Non-Government Agencies associated with entrepreneurship. 3.2. State importance of funds and government fund schemes. 3.3. Explain SSI and Ancillary. 3.4. Explain concept of Business Plan. 3.5. Explain project formulation and analysis. 3.6. State sources of capital	4		CO3	

4	Unit 4: Introduction to Marketing Management: 4.1 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 Behavior The buying process, The difference between B2B buying and B2C buying.	4.1 Analyze Marketing Environments 4.2 Understand the Product Life Cycle (PLC) 4.3 Describe the consumer buying process.	5		CO4	
5	Unit 5: Marketing Strategies, Branding and International Business Expansion 5.1 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 5.3. International Marketing: International Marketing- Setting Objectives & Deciding Policies (Opportunities and Challenges), Organization structure, Entry Modes into new International Markets	5.1 Set objectives and develop policies for international marketing, considering opportunities and challenges. 5.2 Understand international marketing organization structures.	6		CO5	
6	Unit 6: Digital Marketing: 6.1. Establishing a digital presence: Search Engine Optimization (SEO), Content Marketing. 6.2. 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 Select and elaborate various methods of Digital Marketing.	4		CO6	

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

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approximate Hrs. Required
1	1	Biography of any entrepreneur	1
2	1	Self-Disclosure Exercise (Who am I?)	1
3	1	Mind-map	1
4	1	SWOT Analysis	1
5	1	Self-rating questionnaire	1
6	2	Business Plan Preparation	1
7	2	Create a self-assessment to evaluate entrepreneurial traits and identify improvement areas.	1
8	2	Develop action plans, and use achievement motivation principles to stay committed and overcome challenges.	1
9	3	Creativity and innovation process behind Its success Assign students to research and present a famous Innovation	1
10	3	Conduct a brainstorming session for evaluate them based on feasibility, students to generate business Ideas, then scalability, and market demand.	1
11	4	Conduct a market survey to gather data on consumer preferences, demand, and competition, then analyse it to validate their business idea,	1
12	4	Create a financial statement and conduct a cost-volume-profit (CVP) analysis to assess a business's financial health of different sales levels.	1
13	5	Select a brand, analyse its marketing strategy using the 4 P's, and create a report on the effectiveness of its marketing mix.	1
14	5	Design and distribute a market research survey, then present findings to inform business decisions.	1
15	6	Propose an international marketing strategy for a product, considering cultural differences, legal factors, and regulations,	2
16	6	Create a gamified loyalty program or campaign and explore how AI tools, like chatbots, can improve customer Interaction!	2
		TOTAL	18

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

- Solve assignment covering all COs given by teacher.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

- **Hardware Required: LCD Projector**

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 Entrepreneurial Competencies	3	-	-	-	-
2	Business Opportunity Identification & Idea Development	4	-	-	-	-
3	Government Support, Funding and Business Plan Development	3	-	-	-	-
4	Introduction to Marketing Management	3	-	-	-	-
5	Marketing Strategies, Branding and International Business Expansion	4	-	-	-	-
6	Digital Marketing	3	-	-	-	-

I) ASSESMENT TOOL –

J) LEARNING RESOURCES –

• BOOKS

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

• WEBSITES LINKS:

1. https://www.tutorialspoint.com/marketing_management
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>
3. <https://www.slideshare.net>
4. www.Bookboon.com

Mapping Table

Course Outcomes (COs)	Course Outcomes (COs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	1	-	2	1
CO2	2	3	2	1	2	-	1	1	2	-
CO3	2	2	3	1	2	2	1	-	1	2
CO4	2	3	2	1	2	2	1	-	2	-
CO5	2	2	3	-	2	2	1	-	2	1
CO6	2	2	2	2	2	1	2	1	3	1

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Basic Science
Course code	R23CI2701
Course Category	DSC
Credits	5

LEARNING AND ASSESSMENT SCHEME –

Learning Scheme						Assessment Scheme												
Contact Hrs./Week			Self-Learning (Term work + Assignment)	Notional Learning Hrs / Week		Credits	Paper Duration (hrs.)	Theory			Practical (Based on LL & TL)				Based on Self Learning		Total Marks	
C	T	L						FA - TH	S A- TH	Total		FA-PR		SA-PR		SLA		
L	L	L						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*#	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 and derived units. 1.2 System of units (CGS, MKS, FPS and SI), rules and conventions for writing SI units, tables of SI units, multiples and submultiples, significant figures and rules. 1.3 Dimensions and dimensional formulae. 1.4 Errors: Instrumental, systematic and random errors; methods for minimization. 1.5 Estimation and propagation of errors with numericals.	1a. Describe the concept of physical quantities with relevant units. 1b. State various systems of units and their need. 1c. Determine dimensions of physical quantities. 1d. State and justify errors in measurement.	7	9	CO1
2	Unit II: Electricity, Magnetism and Semiconductor 2.1 Charge, Coulomb's law, electric field, electric lines of force, electric field intensity, electric potential and numerical problems. 2.2 Electric current, Ohm's law, resistance, color code, series and parallel resistance. 2.3 Heating effect, Joule's law, electric power and energy. 2.4 Magnetic field, intensity, lines of force and magnetic flux. 2.5 Conductors, semiconductors, insulators and energy band diagrams. 2.6 Intrinsic and extrinsic semiconductors, N-type and P-type semiconductors, p-n junction diode. 2.7 Forward and reverse biasing and I-V characteristics.	2a. Calculate electric field and potential. 2b. Apply laws of series and parallel circuits. 2c. Explain heating effect of current. 2d. Describe magnetic intensity and flux. 2e. Distinguish conductors, semiconductors and insulators. 2f. Explain I-V characteristics and applications of p-n junction diode.	13	14	CO2
3	Unit III: Heat, Laser and Optical Fiber 3.1 Heat, temperature scales, conversions and numericals. 3.2 Conduction, thermal conductivity, Searle's method, comparison with convection and radiation. 3.3 Gas laws and general gas equation. 3.4 Laser principles and optical pumping. 3.5 Types of lasers and applications. 3.6 Reflection, refraction, refractive index, TIR and applications. 3.7 Optical fibre: principle,	3a. Convert temperatures across scales. 3b. Distinguish thermal conductors. 3c. Relate characteristics of gas laws. 3d. Determine specific heat ratio.	10	12	CO3

	construction, working, types and applications.	3e. Describe total internal reflection. 3f. Describe optical fibre propagation.			
4	Unit IV: Introduction to Environmental Chemistry 4.1 Basic concepts and importance in electronics and computers. 4.2 Atmospheric chemistry and air pollution. 4.3 Water chemistry, treatment and monitoring. 4.4 Soil chemistry, contamination and testing.	4a. Study atmosphere, greenhouse gases and climate change. 4b. Explain water purification and impact on electronics manufacturing. 4c. Explain heavy metal toxicity, soil erosion and conservation.	6	9	C04
5	Unit V: Chemistry of Electronic Waste (E-Waste) 5.1 Generation, disposal and recycling of e-waste. 5.2 Fossil fuels and environmental impact. 5.3 Renewable energy and green computing. 5.4 Nuclear energy and radioactive waste. 5.5 Energy storage and battery technologies.	5a. Explain e-waste generation and disposal. 5b. Describe recycling and sustainable practices. 5c. Explain environmental impacts of fossil fuels. 5d. Explain renewable energy technologies.	12	12	C05
6	Unit VI: Environmental Regulations and Compliance 6.1 Environmental regulations for electronics manufacturing. 6.2 Government agencies, international standards and agreements. 6.3 Emerging technologies for sustainable electronics including green materials, IoT, energy harvesting, renewable integration and low-power electronics.	6a. Review environmental regulations and compliance. 6b. Explain sustainable electronics technologies. 6c. Describe integration of renewable energy technologies.	12	14	C06

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

Sr. No.	Practical Outcomes (PrOs)	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 calibrations.
- 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 ± 0.02 mm 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

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
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.	

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

ASSESSMENT TOOL –

Formative assessment

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

(15 marks Physics +15 marks Env.Chem Chemistry)

For laboratory learning 50 marks

(25 marks Physics +25 marks Env. Chemistry)

Summative Assessment

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)

CO-PO Matrix –

CO's	PO1 Basic knowle dge Discipli ne specific knowle dge	PO2 Proble m analys is	PO3 Desig n/ devel opme nt of soluti ons	PO4 Enginee ring Tools, Experim entation and testing	PO5 Engineer ing practices for society, sustainab ility & environm ent	PO6 Project Manage ment	PO7 Lifelong learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	0	0	1	1	1	1			
CO2	3	0	0	1	1	1	1			
CO3	3	0	0	1	1	1	1			
CO4	1	0	0	0	2	0	1			
CO5	2	0	0	1	2	1	1			
CO6	2	1	1	1	2	1	1			

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

www.physicsclassroom.com

www.hyperphysics.com

www.physicsinfo.com <http://nptel.ac.in/course.php?disciplineId=115>

<http://nptel.ac.in/course.php?disciplineId=104>

<http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html>

www.physicsclassroom.com

www.physics.org

www.fearofphysics.com

www.sciencejoywagon.com/physicszone

www.science.howstuffworks.com

www.in.wikipedia.org

www.nptel.iitm.ac.in

www.chem1.com

www.onlinelibrary.wiley.com

www.rsc.org

www.chemcollective.org

www.science.howstuffworks.com

www.in.wikipedia.org

www.nptel.iitm.ac.in

Name and Signature

(Courses Experts)

Name and Signature

Programme Head

Name and Signature

CDC In-charge

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer and IoT Engineering
Course Name	Linux Basics
Course Code	R23CI2601
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	Min	Max	Min	Max	Min	Max	Min	
2	-	2	-	4	2	-	-	-	-	-	25	10	25 @	10	-	-	50

Abbreviations:

Total IKS Hrs. for Sem.: 0 Hrs.

Abbreviations:

CL – Class Room Learning, TL - Tutorial Learning, LL - Laboratory Learning, SLH - Self LearningHours, 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 and directory operations and use vi editor.

3. To learn the Basic Scripting Skills and create 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, C Shell. 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. 2.2 Email basics, mailx: The universal mailer. 2.3 passwd: Changing your password.who: Who are the users?uname: Knowing your machine characteristics. 2.4 tty: Knowing your terminal.stty: Displaying and setting terminal 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, Parent-child relationship, UNIX file system tree, Unix file system, Home directory. 3.1.1 pwd: Checking current directory.cd: Changing current directory.mkdir: Making directories.rmdir: Removing directories.ls: Listing directory contents. 3.2 Absolute pathnames, Relative pathnames. 3.3 Handling ordinary files:cat, cp, rm, mv, more. 3.4 lp subsystem: Printing a file.file: Knowing file types. 3.5 wc, od, cmp, comm, diff. 3.6 gzip, gunzip, tar, zip, unzip.	3.1 Explain 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.	7	CO3

	3.7 rar and unrar. 3.8 Basic file attributes. ls -l, -d option. 3.9 File ownership and permissions .chmod, chown, chgrp. 3.9.1 System Administration: root, su. 3.9.2 User management: useradd, groupadd.			
4	Unit – IV: The vi Editor 4.1 vi Command, Input and Line Editing Modes. 4.2 Creating, Saving and Quitting files. 4.3 vi Editing Commands: Common Operations. 4.4 Navigation: h, j, k, l, b, e, w, 0, , \$, Ctrl-f, Ctrl-b, Ctrl-d, Ctrl-u, G.4.5 Searching patterns (/ and ?), repeating search (n and N).	4.1 Create and modify files using vi editor. 4.2 Use line editing commands. 4.3 Use navigation commands. 4.4 Search patterns in vi editor.	3	CO4
5	Unit – V: Filters, Regular Expressions 5.1 Simple Filters: pr, head, tail, cut, paste, cat, tac, sort, uniq, tr. 5.2 Filters using regular expressions:grep, BRE, ERE, egrep, sed.	5.1 Execute Linux filters. 5.2 Execute commands using regular expressions.	3	CO5
6	Unit – VI: Shell & Shell Programming 6.1 Shell interpretive cycle, offerings, wildcards, escaping, quoting, redirection, /dev/null, /dev/tty. 6.2 Pipes, tee, substitution, Shell Variables. 6.3 Shell scripts, read, command line arguments, exit status, logical operators (&&,). 6.4 if conditional, test, [], case conditional, expr, string handling, \$0.6.5 while loop, for loop, until and for statements.	6.1 Explain the Shell's Interpretive Cycle. 6.2 Use pattern matching and wildcards. 6.3 Use Shell variables. 6.4 Execute shell script programs.	7	CO6

E) PRACTICAL ASSESSMENT 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) rmdir 5) 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	2	CO3

		options:1) touch 2) more 3) lp 4) file 5) wc 6) cmp 7) comm 8) diff 9) split		
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* Execute the following administrator and user management commands:1) Root 2) su 3) useradd 4) groupadd	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

J) LEARNING RESOURCES

• BOOKS

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

• WEBSITE 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 Program 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	PS O-1	PSO-2	PS O-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: –

* PSOs are Programme Specific Outcomes.

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Structure
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Data Structures
Course code	R23CI2602
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	
C	L	T L					L L	FA	TH	SA-TH	Total	FA-PR		SA-PR		SLA		
												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

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.

COURSE OUTCOMES (COS)

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

CO1: Perform basic operations on Arrays.

CO2: Apply different Searching and sorting methods.

CO3: Implement basic operations on Linked List.

CO4: Perform operations on Stack using Array and Linked List Implementations.

CO5: Perform operations on Queue using Array and Linked List Implementations.

CO6: Create and Traverse Tree to solve problems.

C) COURSE CONTENT

Sr. No	Topics And Sub Topics	Unit Outcomes (UOs) / Learning Outcomes (LOs)	CL Hrs./Week	FA-TH. MAX	CO Mapped
1	Unit I - Introduction to Data Structures 1.2 Introduction: Concept and Need of Data Structure, Definition, Abstract Data Type 1.2Types: (i) Linear Data Structures (ii) Non-Linear Data Structures 1.3 Operations: (i) Traversing (ii) Insertion (iii) Deletion 1.4 Complexity: Time and Space, Time space tradeoff	LLO 1.1 Classify data structures based on characteristics and space. LLO 1.2 Perform operations on given data structures.	4	10	CO1
2	Unit II - Searching and Sorting 2.1 Searching: Searching for an item in a data set using the following methods: (i) Linear Search (ii) Binary search 2.2 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	LLO 2.1 Develop algorithms for searching using different techniques. LLO 2.2 Create algorithms for sorting data using given methods.	8	10	CO2
3	Unit III - Linked List 3.1 Difference between Static and Dynamic Memory Allocation. 3.2 Introduction to Linked List, Terminologies: Node, Address, Pointer, Information field/Data field, Next pointer, Null Pointer, Empty List. 3.3 Type of Lists: Linear List, Circular List, Representation of Doubly Linked List. 3.4 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 Linked List, Traversing a Singly Linked List. 3.5 Application of Linked list	LLO 3.1 Differentiate static and dynamic memory allocation. LLO 3.2 Create structures using linked list to represent node. LLO 3.3 Develop algorithms to add/remove elements in linked list.	10	15	CO3

Unit No.	Topics and Sub-topics	Learning Outcomes (LLOs)	CL Hrs./Week	FA-TH MAX.	CO Mapped
4	Unit IV – Stack 4.1 Introduction to Stack: Definition, Stack as an ADT, Operations on Stack (Push, Pop), Stack Operations. 4.2 Conditions – Stack Full / Stack Overflow, Stack Empty / Stack Underflow. 4.3 Stack Implementation using Array and representation using Linked List 4.4 Applications of Stack: Reversing a List, Polish Notations, Conversion of Infix to Postfix Expression, Evaluation of Postfix Expression. 4.5 Recursion: Definition and Application.	LLO 4.1 Represent stack using array and linked list. LLO 4.2 Create algorithms for push and pop operations. LLO 4.3 Convert infix to postfix using stack. LLO 4.4 Evaluate postfix expression.	8	10	CO4
5	Unit V – Queue 5.1 Introduction to Queue: Queue as an ADT. Queue representation in memory using Array and representation using a Linked List. 5.2 Types of Queues: Linear Queue, Circular Queue, Concept of Priority Queue, Double-Ended Queue. 5.3 Queue Operations: INSERT, DELETE. Queue Operation Conditions: Queue Full, Queue Empty. 5.4 Applications of Queue.	LLO 5.1 Represent queue using array and linked list. LLO 5.2 Explain characteristics of different queue types. LLO 5.3 Create algorithms for INSERT and DELETE operations.	6	10	CO5
6	Unit VI – Tree 6.1 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. 6.2 Types of Trees: General Tree, Binary Tree, Binary Search Tree (BST). 6.3 Binary Tree Traversal: In-Order Traversal, Preorder Traversal, Post-Order Traversal. 6.4 Expression Tree, Heap.	LLO 6.1 Describe tree terminology. LLO 6.2 Create a Binary Search Tree based on given data. LLO 6.3 Develop algorithms to traverse trees. LLO 6.4 Create an expression tree. LLO 6.5 Create heap.	9	15	CO6

Sr. No.	Unit No.	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of Hrs.
1	1	Write a C program to perform array operations: Create, Insert, Delete, Display	2
2	2	Write a C program to search data from given array using Linear Search	2
3	2	Write a C program to search data from array of strings using Linear Search	2
4	2	Write a C program to search data from given array using Binary Search	2
5	2	Write a C program to search data from array of strings using Binary Search	2
6	2	Write a C program to sort an array of numbers using Bubble Sort	2
7	2	Write a C program to sort an array of strings using Bubble Sort	2
8	2	Write a C program to sort an array of numbers using Selection Sort	2
9	2	Write a C program to sort an array of strings using Selection Sort	2
10	2	Write a C program to sort an array of numbers using Insertion Sort	2
11	2	Write a C program to sort an array of strings using Insertion Sort	2
12	3	Write a C program to implement Singly Linked List (Insert at beginning, Search, Display)	2
13	3	Write a C program to implement Singly Linked List (Insert end, Insert after, Delete, Display)	2
14	3	Write a C program to create two polynomials using Linked List	2
15	3	Write a C program to add two polynomials using Linked List	2
16	4	Write a C program to perform PUSH and POP operations on stack using array	2
17	4	Write a C program to perform PUSH and POP operations on stack using linked list	2
18	4	Write a C program to multiply two numbers using recursion	2
19	4	Write a C program to print given string in reverse using recursion	2
20	3	Write a C program to create a singly linked list and traverse in reverse using recursion	2
21	5	Write a C program to perform INSERT and DELETE operations on linear queue using array	2
22	5	Write a C program to perform INSERT and DELETE operations on linear queue using linked list	2
23	5	Write a C program to perform INSERT and DELETE operations on circular queue using array	2
24	5	Write a C program to perform INSERT and DELETE operations on circular queue using linked list	2
26	5	Write a C program to create a priority queue using linked list	2
27	6	Write a C program to implement BST (Binary Search Tree) and traverse in In-Order	2

D) PRACTICAL (BASED ON LL & TL) ASSESSMENT WORK (Any 15)

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

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

Not Applicable

F) LABORATORY LEARNING EQUIPMENTS REQUIRED

Hardware Required:

- Computer System with all necessary peripherals
- Internet Connectivity

Software Required:

- C Compiler / GCC Compiler / Online C Compiler

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

Legends:

R = Remembrance

U = Understanding

A = Application and above levels (Revised Bloom's Taxonomy)

Note:

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

I) ASSESSMENT TOOL

• Formative Assessment (Assessment for Learning)

Continuous assessment based on process and product performance indicators.

Each practical:

- 60% weightage to process
- 40% weightage to product

• Summative Assessment (Assessment of Learning)

- End semester examination
- Lab performance
- Viva-Voce

J) SUGGESTED LEARNING MATERIALS / BOOKS

• BOOKS

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

• WEBSITE LINKS

Sr. No.	Link / Portal
1	https://www.javatpoint.com/data-structure-introduction
2	https://www.geeksforgeeks.org/introduction-to-data-structure/
3	https://studyttonight.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/

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

K) CO–PO Matrix

Legends:

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

* PSOs are to be formulated at institute level.

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Digital Techniques & Microcontroller
Course Code	R23CI2603
Course Category	DSC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

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

Abbreviations:

IKS - Indian Knowledge System , CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SL - Self-Learning ,NLH- Notional Learning Hrs /Week, FA - Formative Assessment, SA -Summative Assessment, PR- Practical, SLA - Self Learning Assessment.

A) RATIONALE

In the present era, applications of digital circuits are prevalent in consumer products right from calculators, digital diaries, digital watches, computers, mobile phones to industrial products. So the course Digital Techniques is introduced as a core technology subject in Computer Engineering curriculum. It will enable the students to assemble, design, test and troubleshoot logical circuits such as Flip-flops, shift registers, MUX, DEMUX, A/D and D/A converters. It deals with topics ranging from logic gates, to combinational and sequential logic circuits and memories. It lays a foundation for the knowledge of microprocessors and computers.

B) EXPECTED SKILL/s –

Students will able to test the functionality of digital circuits/ systems

COURSE OUTCOMES (COs)

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

CO1-Understand and use binary, octal, hexadecimal number systems and laws of Boolean algebra.

CO2-Understand concept and working of combinational circuits

CO3-Understand concept of Flip flops , their types and applications

CO4-Understand architecture of 8051 microcontroller.

CO5-Describe software program development tools.

CO6Construct and execute assembly language programs using instruction set of 8051.

C) COURSE CONTENT

Sr. No	Topics And Sub Topics	Unit Outcome UO / Learning Outcome LO	CL Hrs / week	FA TH Max	CO Mapped
1	Logic Gates & Logic Families: 1.1 Number Systems : Decimal, Binary, Octal, Hexadecimal number systems, Conversion from one system to another, signed number representation using 1's and 2's complement, Binary addition, subtraction using 1's and 2's complement, BCD & Gray codes. 1.2 Logic Gates : AND, OR, NOT, EX-OR, Universal gates – NAND, NOR: symbol, truth table, Boolean expression, building basic gates using universal gates. 1.3 Logic Families Introduction to logic families, TTL, ECL, CMOS logic families, characteristics – fan in, fan out, speed, noise immunity, propagation delay, power dissipation, comparison of TTL, ECL, CMOS logic families with reference to above characteristics.	LLO1.1 Convert a number from one number system to another. LLO1.2 Perform arithmetic operations with binary numbers LLO 1.3 Follow the 1's and 2's complement method to subtract binary numbers. LLO 1.4 Convert the coded numbers into different specified form LLO 1.5 Write the application of the specified digital code types. LLO 1.6 Understand the concept of logic families and comparative study of logic families.	6	10	CO1
2	Minimization Techniques: 2.1 Boolean Algebra: Fundamentals of Boolean algebra, basic laws, commutative, associative, distributive laws, duality principle, De-Morgan's theorems 2.2 Combinational Logic Circuits: Introduction to logic design, Sum of products (SOP), Product of sum (POS),	LLO2.1 Understand the laws of Boolean algebra LLO2.2 Understand the concept of SOP a POS, K-map. LLO2.3 Use of K-map for simplification of logic expressions. LLO2.4 Minimize the given logic	6	10	CO2

	2.3 Minimization Techniques: Karnaugh map representation of logic functions, simplification of logical functions using K-map, (2,3,4 variable), Don't care conditions,	expression using K map (upto 4 variables)			
3	Combinational Logic Design and Sequential Logic Design 3.1 Combinational Logic Design: Half adder, Full adder, Half subtractor, Multiplexer–concept, 4:1, 8:1, Demultiplexer–concept, 1:4 Digital circuit design using MUX & DEMUX- one example each Decoder– 3:8, Binary to Gray Code Converter. 3.2 Sequential Logic Design: Basic memory cell, Flip Flop: SR, JK: Preset & Clear, Truth Tables and Excitation tables. Counters: Asynchronous & Synchronous. Registers: SISO, SIPO, PISO, PIPO	LLO3.1 Understand the concept of combinational logic designs. LLO3.2 Understand the concept of Flip-Flop, types of FFs and applications of FFs LLO 3.3 Understand the asynchronous and synchronous counter. LLO3.4 Understand the Concept of register and their types	9	15	CO3
4	The 8051 Microcontroller 4.1 Comparison of Microprocessor, Microcontroller: Overview of 8051 family Terminology: RISC, CISC processors. Harvard and Von Neumann architectures 4.2 Memory types:- PROM, EPROM, EEPROM, FLASH & NVRAM. 4.3 Pin diagram and description of 8051: microcontroller. Architecture of 8051 Microcontroller. Register Bank and PSW. Internal and external memory organization. Specification and comparison of 8051 and 8951	LLO 4.1 Compare microprocessor and microcontroller. LLO 4.2 Compare various architectures. LLO 4.3 Describe functions of various pins of 8051 microcontroller LLO4.4 Explain block diagram of microcontroller LLO 4.5 Compare versions of microcontrollers LLO4.6 Explain memory organization of 8051 microcontroller with neat diagrams.	6	10	CO4
5	8051 Assembly language programming: 5.1 Development systems tools: Editor, Assembler, Linker, Debugger. 8051 Data types & Directives- Decimal, Hex and	LLO 5.1 Explain the function of the given software development tools. LLO 5.2 Explain the use of the given assembler directives with examples	9	15	CO5

	Binary. Directives (ORG,EQU, END) Loop instruction and programs. Jump instructions- conditional & unconditional, Stack –Push & Pop instructions, 5.2 Subroutine : Call instructions, Programs on jump and call instruction, Time delay generation machine cycle, Delay calculations for 8051	LLO5.3 Describe the function of the given instruction with suitable examples. LLO 5.4 Calculate Machine cycle time for given clock frequency			
6	Addressing Modes of 8051: 6.1 Addressing Modes of 8051 Data transfer and arithmetic instructions Logical and compare instructions Rotate and swap instructions. BCD & ASCII Applications 6.2 I/O Programming-bit manipulation instructions	LLO6.1 Identify the addressing mode of the given instruction. LLO6.2 Describe the function of the given instruction with suitable examples. LLO6.3 Write an assembly language program for the given operation. LLO 6.4 Write an ALP to generate the given waveform on given	6	10	CO6

D) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK (Any 12)

Sr.No	Unit no	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs
1	1	Verify the truth tables of logic gates	4	1
2	1	Binary to grey code converter	4	1
3	1	Construction of basic gates using universal gates	2	1
4	3	Construction of half adder and full adder	2	3
5	3	Multiplexer using IC 74153	4	3
6	3	Demultiplexer/Decoder	2	3
7	3	Verification of truth tables of flip-flops using ICs 7474, 7476	4	4
8	4	Identify different sections of 8051 kit and use of Keil simulator	2	4
9	4	Write and execute an assembly program using simulator 8-bit addition and 8-bit subtraction.	2	4

10	5	Write and execute an assembly program using simulator 8-bit Multiplication and 8-bit Division using external memory.	2	5
11	5	Write and execute an assembly program using simulator finding a Square of a given number using a lookup table.	2	5
12	5	Verification of truth tables of flip-flops using ICs 7474, 7476	2	5

Note : Out of above suggestive LLOs -

'*' Marked Practicals (LLOs) Are mandatory.

- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

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

Micro project:

- Implement 1:8 DEMUX using 1:4/1:2 DE-MUX.
- Build a circuit to implement 4 Bit adder.
- Implement 16:1 MUX using 8:1/4:1 MUX.
- Build a circuit to test 7 bet segment display.
- Build a LED display bar.
- use of Keil simulator.

F) LABORATORY LEARNING EQUIPMENTS REQUIRED

Sr.No.	Equipment/Instrument with Broad Specifications
1	VariableDCpowersupply0-30V,2A
2	DigitalMultimeter31/2digitdisplay,9999counts
3	Breadboard840-1000contactpoints
4	Display Trainer boards and kits for experiments
5	Digital Trainer kits with build in DC power supply, switches and LED for output indication.
6	Keil simulator.
7	Use Flash/Animations to explain the working of Microcontroller

G) Suggested Weightage to Learning & Assessment Purpose (Specification Table) :

UNIT NO	UNIT TITLE	Aligned COs	DISTRIBUTION OF THEORY MARKS			
			R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Logic Gates and Logic Families	6	4	4	2	10
2	Minimization Techniques	6	2	4	4	10
3	Combinational Logic Design and Sequential Logic Design	9	4	7	4	15
4	The 8051 Microcontroller	6	5	5	-	10
5	8051 Assembly language programming	9	2	5	8	15
6	Addressing Modes of 8051	6	2	4	4	10
Grand Total			19	29	22	70

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

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

ASSESSMENT TOOL –

Formative assessment (Assessment for Learning)

For laboratory learning 25 marks

- Each practical will be assessed considering - 60% weightage to process and - 40% weightage to product
- Two formative assessment tests of MCQ type for 30 marks and average of two unit tests.

Summative Assessment (Assessment of Learning)

- End semester assessment of 70 marks
- End semester assessment of 25 marks for laboratory learning

• SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No.	Title of Book	Author	Publication(with year)
1	Digital Principle	#MalvinoandLeach	TMH,6 th Ed,2009
2	Modern Digital Electronics	#R.P.Jain	TMH,4 th Ed,2010
3	Digital Logic and Computer Design	M.Morris Mano	PearsonEdu,4 th Ed,2008
4	Digital Integrated Electronics	H. Taub, Schilling	McGrawHillInt,

H) LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://studytronics.weebly.com/digital-electronics.html	Basics of digital electronics
2	https://www.udemy.com/course/digital-logic-circuits-and-design	Introduction to digital number systems and logic gates
3	https://www.geeksforgeeks.org/boolean-algebra	Boolean algebra and logic gates
4	Simulation software:- www.keil.com	Introduction to keil
5	8051 microcontroller:- www.intorobotics.com/8051-microcontroller-programming-tutorials-Simulators-compilers-and-programmers/	Introduction to Microcontroller

CO-PO MATRIX

COURSE OUTCOMES	PROGRAM OUTCOMES							PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO	PSO	PSO
CO 1	3	2	1	-	-	-	-	-	-	2
CO 2	3	3	2	1	2	-	-	1	-	2
CO 3	3	3	2	1	2	-	-	1	-	2
CO 4	3	2	2	1	2	1	1	2		3
CO 5	2	2	1	-	3	2	1	1	1	2
CO 6	3	3	3	2	2	2	1	2	1	3

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

*PSOs are to be formulated at institute level

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

Diploma Programme	Computer Engineering and IoT
Course Name	Internet of Things and Applications (IoT)
Course code	R23CI2604
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
C L	T L	L L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA		
									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:

In an era where the Internet is evolving to seamlessly connect people with physical entities and facilitate real-time interactions between physical objects, the rise of the Internet of Things (IoT) is inevitable. This course serves as a fundamental gateway for students to grasp the essentials of IoT and its protocols. By introducing key application areas, the curriculum equips students with insights into the practical domains where IoT finds relevance.

IoT plays a crucial role in both industrial sectors and domestic applications. This subject acts as a foundational guide, offering students a comprehensive understanding of IoT concepts, principles, and the operational dynamics of various IoT system elements. The acquired knowledge positions students to develop competence in navigating industrial sectors and addressing diverse domestic applications, providing them with valuable skills for a dynamic and evolving professional landscape.

B) EXPECTED SKILL/s –

Students will able to test the working of IoT devices.

C) COURSE OUTCOMES (COs):

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

CO1. Understand the fundamentals of IoT and IoT enabling technologies.

CO2. Identify Sensors and actuators for interfacing with Raspberry Pi board required for IoT.

CO3. Describe Architecture of Raspberry Pi and Arduino.

CO4. Construct and execute Python program for Raspberry Pi board. CO5.

Understand the IoT network protocols.

CO6. Develop a small IoT based application.

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 1: Introduction to IoT 1.1 IoT: Definition and characteristics of IoT. 1.2 Technical Building blocks of IoT. 1.3 Physical design of IoT. 1.4 Logical design of IoT, IoT functional blocks. 1.5 IoT enabling technologies, IoT Issues and challenges.	1.a. Draw the block Diagram of Basic IoT System. 1.b. Draw Architecture of IoT. 1.c. List categories of IoT.	7	10	CO1
2	Unit 2: IoT Smart Devices 2.1 Introduction of Sensors: Sensors - Definition, types of sensors block diagram, working, Evolution of sensor technology, Principles of sensing, Sensor characteristics. 2.2 Introduction to Actuators: - Definition, Types of actuators block diagram, working. 2.3 Interfacing: Explain the I/O interfaces for sensors, Analog-to-digital conversion.	2. a. Understand the fundamentals of sensors and actuators. 2.b Identify and Explain various types of sensors and actuators. 2. c. Draw and explain block diagram of Sensor and Actuators.	8	10	CO2
3	Unit 3: IoT Platforms 3.1 What is an IoT Device, Exemplary Devices: Raspberry Pi, Introduction to Raspberry Pi Board, Pin Diagram of Raspberry Pi Board, RFID Principles and components. Accessing Raspberry Pi from computer via Remote Desktop Connection.	3. a. Draw and explain pin diagram of Raspberry Pi board. 3. b. Draw and explain Pin Diagram of Arduino UNO Board. 3.c Explain the differences between BeagleBone Black,	8	15	CO3

	3.2 Arduino IDE and Board Types, Configuration of Arduino UNO Board, Pin Diagram of Arduino UNO Board, Establishing connections with a computer. 3.3 Other IoT Devices: BeagleBone Black, CubieBoard with development boards.	CubieBoard, and other IoT development boards (e.g., Raspberry Pi, Arduino).				
4	Unit 4:Raspberry Pi with Python Programming . 4.1 Introduction, Python vs. Other Languages, Applications of Python 4.2 Understanding Python, Interpreted Languages 4.3 Variables, Keywords, Operators and Operands 4.4 Data Types in Python, Importing Libraries 4.5 Flow Control, Conditional Statement, Loops	4. a. Differentiate between python and other languages. 4.b. Understand Python Programming Basics	9	15	CO4	
5	Communication under IoT 5.1 IoT Protocols: MQTT, CoAP, XMPP and AMQT. 5.2 IoT communication models. 5.3 IoT Communication technologies: Bluetooth, BLE, Zigbee, NFC, RFID, LiFi, Wi-Fi 5.4 Interfacing of wifi, RFID, Zigbee, NFC with development board.	5. a. Describe the characteristics, advantages, and disadvantages of IoT protocols (MQTT, CoAP, XMPP, AMQP). 5. b. Understand IoT communication models. 5. c. Identify and describe various IoT communication technologies (Bluetooth, BLE, Zigbee, Z-Wave, NFC, RFID, LiFi, Wi-Fi).	7	10	CO5	
6	Applications of IoT: 6.1 Introduction, Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, 6.2 Legal challenges, IoT design Ethics, IoT in Environmental Protection.	6. a. Explain working of different real time Applications of IoT. 6. b Recognize the importance of IoT design ethics and its impact on society.	6	10	CO6	

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

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approximate Hrs. Required
1	3	Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation). Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.	2
2	3	Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDs/Buzzer. Understanding GPIO and its use in program.	2
3	3,4	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle.	2
4	3,4	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDs.	2
5	3, 4	Understanding the connectivity of Raspberry-Pi /Beagle board circuit with Water sensor. Write an application to detect the level of water	2
6	3, 4	Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.	2
7	3,4	Understanding and connectivity of Raspberry-Pi /Beagle board with Ultrasonic Sensor. Write an application to measure distance of an object.	2
8	3,4	Connect a color sensor to GPIO pins of raspberry Pi. Write a program to detect color of a object.	2
9	3,4	Write a program to alert the user through SMS and email notification if humidity is greater than a threshold value using Think speaks cloud.	2
10	3,4	Controlling a DC Motor/fan using Raspberry Pi	2
11	3,4,6	Understanding and interfacing of LEDs with Raspberry Pi / Arduino board. Write an application to simulate traffic light system using LEDs.	2
12	3,4,5	Understanding and interfacing of 16×2 / I2C LCD with Raspberry Pi / Arduino board. Write an application to display sensor data on LCD.	2
13	5,6	Understanding and interfacing of Wi-Fi module with Raspberry Pi / Arduino board. Write an application to transmit sensor data to cloud/server and monitor it for smart home automation.	2

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

- Solve assignment covering all COs given by teacher.
 - **Mini Project**
 - Create a simple web interface for Raspberry-pi/Beagle board to control the connected LEDs remotely through the interface.
- OR**
- Write an application using Raspberry-Pi /Beagle board to control the operation of a hardware simulated traffic signal.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

- **Hardware Required:** Raspberry Pi board, LED Different Sensor - IR Sensor, Temperature Sensor, Water Sensor.
- **Software Required:** Python IDLE, Arduino IDE.

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 IoT	7	4	6	-	10
2	IoT Smart Devices	8	4	6	-	10
3	IoT Platforms	8	6	9	-	15
4	Raspberry Pi with Python Programming.	9	4	7	4	15
5	Communication under IoT	7	4	6	-	10
6	Applications of IoT	6	4	6	-	10
	Grand Total	45	26	40	4	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**
 - 1) End semester examination, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title of Book	Author	Publication
1	Internet of Things: A Hands-On Approach	Arsheep Bahga, Vijay Madisetti.	VPT Paperback 2015, ISBN: 978-0996025515 628/- 2
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetti Cisco	Press – Paperback –16 AISBN: 978-1-58714-456- 1599.

3	Arduino Programming in 24 Hours, Sams Teach Yourself.	Blum Richard	Kindle Edition
4	Smart Internet of Things Projects	Agus Kurniawan	Sep 2016 2012 ISBN: 97881331766613

• **WEBSITES LINKS:**

1. http://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf
2. <https://www.arduino.cc/en/Guide/ArduinoUno>
3. <https://www.electrorules.com/raspberry-pi-4-gpio-pinout>
4. <http://www.nptel.ac.in>

K) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

Name & Signature:

(Programme Head)

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	User Interface Programming
Course code	R23CI2605
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	
C	T	L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA			
L	L	L					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		
2	-	2	-	4	2	-	-	-	-	-	50	20	50#	20	-	-	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

.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)

Students will be able to

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 Elseif 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, OpenFileDialog 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

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.	Installation of Software Vb. Net and understanding its GUI	LLO 1.1 Install 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 using controls 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

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

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	Installation of the software VB.Net.	All

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

-

I) 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

J) 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/>

K) CO-PO Matrix –

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

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Embedded Operating System
Course Code	R23ci2603
Course Category	DSC
Credits	4

LEARNING AND ASSESSMENT SCHEME –

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
	C L	T L	L L	FA TH					SA-TH	Total		FA-PR		SA-PR		SLA			
										Max	Min	Max	Min	Max	Min	Max	Min		
-	4	-	2	2	8	4	3	30	70	100	40	25	10	25#	20	25	10	175	

Abbreviations:

IKS - Indian Knowledge System , CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SL - Self-Learning ,NLH- Notional Learning Hrs /Week, FA - Formative Assessment, SA -Summative Assessment, PR- Practical, SLA - Self Learning Assessment.

A) RATIONALE

The field of Embedded Systems is both dynamic and complex. To address the challenges posed by this expanding technology, students must be proficient in embedded systems and real-time implementations that showcase practical applications. This course equips students with knowledge about various devices and buses, as well as the principles of microcontroller design.

It provides an in-depth understanding of embedded hardware architecture, interfacing techniques, communication buses and protocols, hardware and software interrupts, embedded software programming, modelling, inter-process synchronization, and real-time operating systems.

B) EXPECTED SKILL/s –

Students will be able to test the functionality of embedded system and operating system.

COURSE OUTCOMES (COs)

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

CO1-Describe the major components of embedded systems and System on Chip (SoC).

CO2- State the services and types of Operating System.

CO3-Illustrate the process managements, inter-process communication and concept of threads.

CO4-Describe the basic concept of real time operating system and their uses in embedded system.

CO5-Understand the concept of device driver and ISR.

CO6- Apply the concept of Internet of Things.

C) COURSE CONTENT

Sr. No	Topics And Sub Topics	Unit Outcome UO / Learning Outcome LO	CL Hrs / week	FA TH Max	CO Mapped
1	Introduction to Embedded Systems 1.1 Embedded Systems 1.2 Application Areas 1.3 Categories of Embedded Systems 1.4 Embedded System Architecture 1.5 Embedded Hardware Units 1.6 Examples of Embedded Systems 1.7 Case Study of digital camera 1.8 Case Study of automatic chocklet vending machine	LLO1.1 Explain Embedded System and state application areas of embedded systems. LLO1.2 Give classification of Embedded systems. LLO1.3 Draw architecture of Embedded systems. LLO1.4 Draw block diagram of System on Chip. LLO1.5. Write hardware and software components of given embedded system	6	10	CO1
2	Introduction to OS 2.1 Introduction to OS 2.2 Goal of Operating system and Abstract view of the components of a computer system. 2.3 Operating system services (functions), 2.4 Types of Operating System- Batch Operating System, Multiprogramming Operating System, Time sharing systems, Real time systems, Distributed System. 2.5 Structure of Operating System: Simple Structure, Layered Approach, Microkernel, client-server model.	LLO2.1 Operating system concept LLO2.2 Services provided by an operating system. LLO2.3 Types of operating system. LLO2.4 Understand the various structures of O.S. LLO2.5 Concept of shell, files, processes and system calls	6	10	CO2

3	Processes Management and Threads 3.1 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. 3.2 Interprocess Communication: Shared Memory System, Message Passing System- Naming, Synchronization, Buffering. 3.3 Threads: overview, benefits, multithreading models-many to one, one to one, many to many	LLO3.1 Understand the concept of process, context switching LLO3.2 IPC with its two types- shared memory and message passing LLO3.3 Concept of threads.	9	15	CO3
4	Embedded /RTOS concepts 4.1 Architecture of Kernel 4.2 Interprocess Communication 4.3 Task and Task scheduler 4.4 Semaphore 4.5 Mailbox 4.6 Pipes 4.7 Specification of RTOS in Embedded systems 4.8 Starvation 4.9 Deadlock	LLO4.1 Draw architecture of Kernel. LLO4.2 Explain Inter-process communications. LLO4.3 Describe various IPC functions. LLO4.4 Give specifications of RTOS. LLO4.5 Explain Starvation and deadlock.	6	10	CO4
5	Device Driver and Interrupt Service Mechanism 5.1 Device Driver concept 5.2 ISR concept 5.3 Interrupt sources 5.4 Interrupts handling Mechanism 5.5 Context-context switching 5.6 Interrupt Latency and Deadline 5.7 Direct Memory Access	LLO 5.1 Explain device driver concept. LLO5.2 Describe interrupts handling mechanism. LLO5.3 Explain context switching. LLO5.4 Draw and explain Direct Memory Access	9	10	CO5
6	Internet of Things 6.1 Internet of Things 6.2 Introduction to Raspberry Pi 6.3 Python programming for Raspberry Pi 6.4 Getting Familiar with the GPIO Pins of your Pi 6.5 Sensor Interfacing	LLO6.1 Explain concept IOT LLO6.2 Identify various blocks of Raspberry Pi board. LLO6.3 Understand Python programming for Raspberry Pi LLO6.4. Interface various sensors to Raspberry Pi	6	15	CO6

D) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK (Any 10)

Sr.No	Unit no	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs
1	1	Identify different sections of PSoC Development Board.	4	1
2	1	Develop and execute C language program for 8 bit & 16 bit numbers using PSoC Development Board.	4	1
3	1	Develop and execute C language program for arithmetic and logical operations.	2	1
4	3	Develop and execute C language program to generate square wave on port of 8051.	2	3
5	3	Develop and execute C language program to blink a LED connected on port pin.	4	3
6	3	Develop and execute C language program for serial port communication to transfer CWIT on HyperTerminal	4	3
7	6	Interfacing of LED to Raspberry Pi	2	3
8	6	Interfacing of Switch to Raspberry Pi	2	4
9	6	Interfacing of DC motor to Raspberry Pi	2	4
10	6	Interfacing of LCD to Raspberry Pi	2	4
11	6	Interfacing of IR sensor to Raspberry Pi	2	5
12	6	Interfacing of Ultrasonic sensor g to Raspberry Pi	2	5

Note : Out of above suggestive LLOs -

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

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

Micro project:

- a. Market Survey of Embedded system –Digital camera and Cell Phone
- b. Case Study based on embedded applications.
- c. use of Keil simulator.
- d. Build a LED display bar.
- e. Prepare IOT model for smart city applications..

F) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No.	Equipment/ Instrument with Broad Specifications
1	8051 Microcontroller Trainer Kit.
2	Raspberry Pi development board.
3	8051 Simulator Software (Web version)
4	Computer system (Latest version)
5	Peripheral interface kits

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

UNIT NO	UNIT TITLE	Aligned COs	DISTRIBUTION OF THEORY MARKS			
			R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Introduction to Embedded Systems	CO1	4	4	2	10
2	Introduction to OS	CO2	2	4	4	10
3	Processes Management and Threads	CO3	4	7	4	15
4	Embedded /RTOS concepts	CO4	5	5	-	10
5	Device Driver and Interrupt Service Mechanism	CO5	2	4	4	10
6	Internet of Things	CO6	2	5	8	15
Grand Total			19	29	22	70

Legends: R = Remembrance; U= Understanding; A= Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

ASSESSMENT TOOL –

Formative assessment (Assessment for Learning)

For laboratory learning 25 marks

- Each practical will be assessed considering - - 60% weightage to process and - 40% weightage to product
- Two formative assessment tests of MCQ type for 30 marks and average of two unit tests.

Summative Assessment (Assessment of Learning)

End semester assessment of 25 marks for laboratory learning

- End semester assessment of 70 marks

SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No.	Title of Book	Author	Publication (with year)
1	Embedded / Real-Time Systems	Dr. K.V.K.K. Prasad	Dreamtech press
2	Embedded Systems-Architecture, Programming and Design	Raj Kamal	Tata McGraw-Hill Publishing Company Limited
3	Embedded System Design	Frank Vahid/Tony Givargis	Wiley India Education
4	Operating System Concepts	Silberschatz Galvin and Gagne	Wiley India Pvt. Ltd., 7th Edition, 2006
5	Operating Systems	Achut S. Godbole	Tata McGraw Hill, 2nd Edition, 2005

LEARNING WEBSITES & PORTALS

1. <http://www.os-book.com/>
2. <http://williamstallings.com/OS/OS5e.html>
3. www.Keil.com
4. www.infocenter.arm.com
5. www.embedded.com

CO-PO MATRIX

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

Legends :- High:03, Medium:02, Low:01, No Mapping: - PSOs are to be formulated at

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Database Management Systems
Course code	R23CI2607
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	Min	Max	Min	Max	Min	Max	Min		
3	-	4	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.

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: Database concepts: -Data, Database, Database management system, Database System Applications, Purpose of Database Systems (File system Vs DBMS). View of Data – Data Models, Relational Data Model, Data Abstraction, Instances and schemas,. Database Languages --Data Definition Language, Data Manipulation Language, Database access from application programs. Data Engine: Storage Manager, The Query Processor. Database and Application Architecture. 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	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.	2.a. Creating the tables using DDL commands and manipulating the data using DML commands 2.b. Write the SQL queries. TLO 1.4 Identify the various components of the E-R model and Draw the E-R diagram.	8	10	CO2
3	Structured Query Language (SQL): Overview of SQL, Data Types in Oracle, Sublanguages of SQL-Data Definition Language (create, alter, truncate, drop), Data Manipulation Language (insert, select, update, delete). Oracle transactions(Transaction	3.a. Writing the queries for creating the user and granting the permissions. 3.b. Describe the integrity constraints 3.c. Normalize the database using different normal forms	9	15	CO3

	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. Integrity constraints: Types of integrity constraints: -1) Domain integrity constraint 2) Entity integrity constraint 3) Referential integrity constraint, Joins: Types of Joins, Nested queries. Encryption and its Applications – Encryption Techniques.				
4	4.1 Procedural Language/Structured Query Language (PL/SQL): Introduction to PL/SQL, advantages of PL/SQL, the generic PL/SQL 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). Error handling in PL/SQL, oracle's named exception handlers: user-named exception handlers, user defined exception handling (For Business Rule Validations).	4.a. Write the simple PL/SQL programs using control structures 4.b. Handling the in-built and user defined exception	8	15	CO4
5	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 Deadlock Handling – Deadlock Prevention..	5a. Write PL/SQL program using cursor. 5b. Understand the concept of Transaction, ACID properties and Locks 5c. Understand the Deadlock concept and Deadlock Handling	8	10	CO5

	Deadlock Detection and Recovery—Deadlock Detection, Recovery from Deadlock. Database Backup: Types of failures, Causes of failures ,Database backup introduction ,types of database backups: physical & Logical				
6	6.1 PL/SQL Database Objects (Functions): What are Functions? Where do stored functions reside? How does the oracle engine 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	6a. Write the PL/SQL program using functions. 6b. Understand the concept of distributed database, data storage and distributed transaction.	5	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.	Install the provided database software	LLO 1.1 Installation of database software	2	CO2
2.	To use the Data Definition Language (DDL) for creating, altering and dropping 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.		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.	LLO11.1 Execute queries using character functions LLO11.2 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.	LLO14.1 Write queries for applying Referential Integrity Constraints for suitable relation	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 LLO 19.1 Implement PL/SQL program using Conditional Statements	2	CO4
18.	Write a PL/SQL program using iteration Statements in PL/SQL.	LLO 20.1 Implement PL/SQL program using Iterative Statements	2	CO4
19.	Write a PL/SQL program using Exceptions in PL/SQL.	LLO 21.1 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 22.1 Create implicit cursors	2	CO5
21.	Write a PL/SQL program to implement Explicit cursor.	LLO 23.1 Create explicit cursors	2	CO5
22.	Write a PL/SQL program to implement Cursor for loop and parameterized cursor	LLO24.1 Create cursors using Cursor for loop and also passing parameters to cursor	4	CO6
23.	Write a PL/SQL to create Functions in PL/SQL	LLO25.1 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 judicious 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
		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**
 - 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.htm
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 Matrix –

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

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Computer Networks And Security
Course Code	R23CI2608
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
C L	T L	L L					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

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.

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

A) RATIONALE

The earlier picture of single computer serving all the roles in an industry or any other application field has been replaced by network of computers. A computer network is an interconnection of a group of computers for sharing of data, resources etc. The course contents included in this subject such as network design, LAN implementation, network components, various layer protocols, IP address mechanism, DNS configuration, and Network Security help students to understand the basic concepts of networking and design the network as per requirements.

B) EXPECTED SKILL/s –

Students will be able to identify network types and topologies, select suitable Ethernet standards, explain OSI/TCP-IP principles and protocols, relate transport and application layer protocols, design IPv4 networks, and recognize the role of cryptography in network applications.

C) COURSE OUTCOMES (COs)–

The students will 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 to Computer Network: 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) 2.4 Architecture, Comparison of Wired and Wireless LAN, Frequency bands. 2.5 Standards: IEEE 802.11, Wi-Fi, Bluetooth	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.	7	10	CO2
3	Data link and Network Layer Protocols: A. Data Link Layer 3.1 Design 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 3.4 IP: IP Datagram, Version, Service Type, Identification, Flags, TTL, Protocol, header, Checksum, Options.	TLO3.1 Understand the protocols used at data link & network layer. TLO3.2 Understand the design issues and services of the Data Link Layer TLO3.3 Apply framing and error detection/control techniques TLO3.4 Analyze flow control and congestion control mechanisms TLO3.5 Evaluate Data Link Layer protocols TLO3.6 Understand the structure and working of IP protocol TLO3.7 Analyze IP packet handling and routing basics TLO3.8 Understand ARP & RARP protocol and its	8	15	CO3

	3.5ARP: ARP Introduction, Structural Diagram, ARP Process RARP: RARP Introduction, RARP Process	functioning.			
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 4.1 Understand the structure of IP addressing TLO 4.4 Understand different classes of IP addresses TLO 4.3 Understand DHCP protocol TLO 4.4 Understand advantages and applications of DHCP TLO 4.5 Understand and Analyze subnet masking techniques TLO 4.6 Understand routing concepts and algorithms Analyze Link State Distance Vector routing algorithm	8	10	CO4
5	Transport and Application Layer Protocols 5.1 TCP: Role of transport layer, functions of transport layer, applications 5.2 UDP: UDP header format, limitations, comparison of TCP and UDP, applications 5.3 MQTT: Architecture, features, applications 5.4 COAP: Architecture, features, applications, comparison with MQTT 5.3 SMTP: Architecture, User Agent, Mail Transfer Agent, Mail Access Agent - Post Office Protocol, version 3 (POP3) Multipurpose Internet Mail Extension (MIME) 5.4 DNS- Purpose, Architecture	TLO 5.1 Understand the protocols used at Transport & Application layer.	8	15	CO5
6	IoT Network Security 6.1 IoT vulnerabilities –Weak passwords, insecure communication, Insufficient Authentication and Authorization, Lack of Software/ Firmware Updates 6.2 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 Security challenges - Device Hijacking, Data Breaches	TLO 6.1 Understand the Network and web security importance.	7	10	CO6

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

SR.No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx . Hrs. Required
1	1	*Case study-To explore the features and capabilities of Cisco Packet Tracer as a network simulation tool.	2
2	1	*To design and implement Client-Server architecture using Cisco Packet Tracer	2
3	1	*To design and implement Peer-to-Peer architecture using Cisco Packet Tracer.	2
4	1	*To create and simulate bus, star, mesh, tree, ring and hybrid network topologies using Cisco Packet Tracer for understanding basic networking concepts.	2
5	1,2	*To create a simulated network environment representing a college department setup using Cisco Packet Tracer.	2
6	3	*To develop and simulate the Stop-and-Wait protocol using a programming language.	2
7	3	*To design and implement the Sliding Window protocol in a programming language.	2
8	4	*Configuring IP address in windows and executing networking commands in cmd.	2
9	4	*Design a wireless network/in Cisco packets tracer and observe the performance.	2
10	5	*To design and simulate a TCP-based client–server network and verify reliable data transmission using the HTTP application in Cisco Packet Tracer.	2
11	5	*To simulate Internet of Things (IoT) communication using the MQTT publish–subscribe protocol in Cisco Packet Tracer.	2
12	5	To study the working of the Constrained Application Protocol (CoAP) by simulating IoT device communication in Cisco Packet Tracer.	2
13	6	*Use a simple substitution cipher to shift letters by a chosen key and decrypt to original text, demonstrating classical encryption.	2
14	6	Replace each alphabet with a fixed mapped letter, perform encryption/decryption, and observe limitations of monoalphabetic ciphers.	2

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

- Solve assignment covering all COs given by teacher

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.
- 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.
- If the course does not have associated SLA component ,above suggestive listings is applicable to Tutorials and maybe consider

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	Cisco Packet Tracer tool	All

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

Unit No.	UnitTitle	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Computer Network	7	5	3	2	10
2	Local Area Network	7	3	3	4	10
3	Data link and Network Layer Protocols	8	5	5	5	15
4	IP Addressing and Routing	8	3	3	4	10
5	Transport and Application Layer Protocols	8	5	5	5	15
6	IoT Network Security	7	3	3	4	10
	Total	45	24	22	24	70

I) ASSESMENT TOOL –

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

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No.	Title of Book	Author	Publication (with year)
1	Data Communication and networking(2 nd Edition)	#Behrouz A.Forouzan	TMG,2 nd Ed;2003
2	Computer Networks	#A.S .Tanenbaum	PHI,4 th Ed;2002
3	Network Security Essentials	William Stalling	PHI,3 rd Ed;2006
4	Computer Networks And Internets with Internet Applications	Douglas E. Comer	PE,4 th Ed;2003

• WEBSITES LINKS

Sr. No.	Link / Portal
1.	http://www.cse.iitk.ac.in/users/dheeraj/cs425/index.html
2.	www.networktutorials.info
3.	http://www.mhhe.com/engcs/compsci/forouzan/dcn/student/olc/
4.	www.datacottage.com
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	2	-	-
CO2	3	2	2	1	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	3	-	-
CO4	3	3	3	2	-	-	-	3	-	-
CO5	3	2	2	2	-	-	-	2	2	-
CO6	2	2	2	1	3	2	3	2	1	3

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

Name & Signature: (Course Experts)	
Name & Signature: (Programme Head)	Name & Signature: (CDC In-charge)

Diploma Programme	Computer Engineering and IoT
Course Name	Internet of Things Architecture and Protocols (IoTAP)
Course code	R23CI2609
Course Category	CORE
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
C L	T L	L L					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA		
									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:

The Internet of Things (IoT) and Industrial IoT (IIoT) have revolutionized connectivity, automation, and decision-making across industries. Understanding their evolution, architecture, and enabling technologies is key to developing IoT applications. Designing IoT systems involves networking, communication models, and core technologies like M2M, SCADA, WSN, and RFID for seamless integration. Effective communication relies on standardized protocols, security frameworks, and addressing interoperability challenges. A layered communication approach (PHY/MAC, network, transport, session) ensures efficient data transfer and security. In IIoT, automation and data-driven insights improve operational efficiency but introduce challenges like security, scalability, and risk management. A strong IIoT architecture with encryption, authentication, and service-based frameworks ensures system reliability and future growth, enabling the design and implementation of secure, real-world IoT solutions.

B) EXPECTED SKILL/s –

Students will be able to design, implement, and secure IoT/IIoT systems with efficient networking, protocols and security management.

C) COURSE OUTCOMES (COs):

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

CO1: Understand IoT evolution, architecture, and technologies.

CO2: Apply IoT design methodology, networking concepts, and communication models to develop IoT systems.

CO3: Analyse and implement IoT protocols and standards such as MQTT, Zigbee, and 6LoWPAN.

CO4: Apply layered communication protocols and security mechanisms for efficient and secure IoT data transmission

CO5: Analyse IIoT applications, workflows, risks, and develop secure IIoT solutions.

CO6: Design scalable, secure IIoT architectures using service frameworks.

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 1:IoT Overview and Technologies - 1.1 Evolution of Internet of Things, IoT architecture outline. 1.2 Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Difference between M2M and IoT 1.3 Cloud Services: IAAS, PAAS, SAAS, IoT Specific Cloud Services 1.4 RFID: Introduction to RFID and its Applications in IoT	1.a Understand the concept and evolution of the Internet of Things (IoT) 1.b. Understand M2M (Machine-to-Machine) Communication 1.c. Understand the IoT World Forum (IoTWF) standardized architecture 1.d. Distinguish between M2M and IoT 1.e. Understand cloud service models	8	15	CO1
2	Unit 2:IoT Design Methodology 2.1 IoT Design Methodology: Steps, Basics of IoT Networking, Networking Components, Internet Structure, Connectivity Technologies, 2.2 IoT Communication Models and IoT Communication APIs, Sensor Networks, 2.3 Four pillars of IoT: M2M, SCADA, WSN, RFID.	2. a. Understand IoT Design Methodology 2.b. Understand IoT communication Model. 2. c. Understand the importance and roles of the four pillars of IoT	7	10	CO2

3	Unit 3: IoT Protocols 3.1 Communication Protocols for IoT and Networks: Protocol Standardization for IoT, M2M, and WSN Protocols, Modbus Protocol, Zigbee Architecture 3.2 IP-Based Protocols MQTT (Secure), 6LoWPAN 3.3 Challenges and Frameworks in IoT Standardization: Issues with IoT Standardization, Unified Data Standards 3.4 IoT Protocols IEEE 802.15.4, BACNet Protocol, APS Layer	3. a. Understand the need for standardization in IoT, M2M, and WSN. 3. b. Understand the role of IP based protocols. 3. c. Identify the challenges in IoT standardization and the importance of unified data standards. 3. d. Learn about key IoT protocols including IEEE 802.15.4, BACNet, and the APS Layer in IoT systems.	8	10	CO3	
4	Unit 4: Layered Communication Protocols in IoT 4.1 PHY/MAC Layer: Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy 4.2 Network Layer: IPv4, IPv6, 6LoWPAN, ICMP, RPL, COAP 4.3 Transport Layer: (TCP, UDP, DCCP, SCTP)-(TLS, DTLS) 4.4 Session Layer: HTTP, SAP, SIP, PPTP	4. a. Understand the role of PHY/MAC layer in IoT communication. 4.b. Understand the Network Layer protocols 4. c. Compare transport protocols: TCP, UDP, DCCP, SCTP in IoT communication. 4. d. Understand session-layer protocols: HTTP, SAP, SIP, PPTP in IoT applications.	9	15	CO4	
5	Unit 5: IIOT 5.1 Introduction, Evolution of IIOT, Advantages of IIOT, 5.2 Drivers, Risk associated with IIOT 5.3 Applications of IIOT, Workflow of IIOT, Security considerations and challenges, 5.4 IIOT Use Cases: Supply Chain Optimization, Smart Factory, Predictive Maintenance	5. a. Understand the concept, evolution, and advantages of IIoT in industrial automation. 5. b. Identify key drivers of IIoT adoption and analyze the risks associated with its implementation. 5. c Examine specific industry use cases showing IIoT's impact on efficiency, productivity, and innovation.	6	10	CO5	

6	Unit 6: Architecture of IIOT	6. a. Understand the layered architecture of IIoT and its role in industrial automation.	7	10	CO6
	6.1 IIoT 5-Layered Architecture (Perception, Network, Edge, Processing, Application Layers) 6.2 Security in IIoT, Encryption, Authentication 6.3 Service-Based Frameworks in IIoT, Service-Oriented Architecture (SOA) 6.4 Challenges and Future Trends in IIoT 6.5 Edge Computing in IIoT, Automation in IIoT	6. b. Learn about Service-Oriented Architecture (SOA) and service-based frameworks in IIoT. 6. c. Identify challenges in IIoT deployment and explore emerging trends shaping its future.			

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

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Appr o. Hrs Required
1	1	Enhancing IoT with RFID Technology.	2
2	1	Precision Farming with IoT and Cloud.	2
3	1	IoT Design Methodology for Smart Traffic Management Using RFID, IR, and Ultrasonic Sensors.	2
4	1	Implementing IoT World Forum (IoTWF) Architecture in Smart City Projects.	2
5	2	Smart Grid and Energy Management with Wireless HART, Zigbee, and BLE	2
6	2	Industrial Automation Using IoT Protocols.	2
7	3	Securing IoT Networks with Secure MQTT Protocols in Healthcare Applications.	2
8	4	Build a basic wireless sensor network using Zigbee or Bluetooth Low Energy (BLE).	2
9	4	Set up password protection for a simple IoT device (e.g., a Wi-Fi-controlled LED).	2
10	3,4	Simulate a Smart Home Dashboard for Remote Control of Appliances (Lights & Fans).	2
11	3,4	Visualize Real-Time IoT Sensor Data (Temperature & Humidity)	2
12	3,4	Simulate a Smart Parking System with Occupancy Detection	2
13	5	To simulate an IIoT-based smart factory system for monitoring temperature and machine status.	2

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

- Solve assignment covering all COs given by teacher.
- **Mini Project**
 - IIoT-Based Smart Factory for Production Line Monitoring

OR

- Smart Parking System with IoT Sensors using Wokwi simulator.

G) LABORATORY LEARNING EQUIPMENTS REQUIRED –

- **Hardware Required:** Raspberry Pi board, Adapters, JumperWire, LED, Different Sensors.
- **Software Required:** Python IDLE, Arduino IDE, Wokwi Simulator

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	IoT Overview and Technologies	7	4	6	-	10
2	IoT Design Methodology	8	4	6	-	10
3	IoT Protocols	8	6	9	-	15
4	Layered Communication Protocols in IoT	9	4	7	4	15
5	IIoT	6	4	6	-	10
6	Architecture of IIoT	7	4	6	-	10
	Grand Total	45	26	40	4	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**
 - 1) End semester examination, Viva voce

J) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title of Book	Author	Publication
1	Internet of Things: Hands-on Approach	ArsheepBahga, Vijay Madiseti.	VPT Paperback 2015, ISBN: 978-0996025515 628/- 2
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetti Cisco	Press – Paperback –16 AISBN: 978-1-58714-456- 1599.
3	Arduino Programming in 24 Hours, Sams Teach Yourself.	Blum Richard	Kindle Edition
4	Smart Internet of Things Projects	AgusKurniawan	Sep 2016 2012 ISBN: 97881331766613

- **WEBSITES LINKS:**

1. http://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf
2. <https://www.arduino.cc/en/Guide/ArduinoUno>

3. <https://www.electrurules.com/raspberry-pi-4-gpio-pnout>

4. <http://www.nptel.ac.in>

K) CO-PO Matrix

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

Diploma Programme	COMPUTER ENGINEERING AND IOT
Course Name	Wireless Ad-Hoc Network
Course code	R23CI2611
Course Category	DSC
Credits	2

Teaching and Examination 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	
C L	T L	L L					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	

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.

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

A) RATIONALE

Wireless Ad Hoc Networks enable infrastructure-less communication in dynamic environments and are essential for modern wireless and IoT systems. This course provides knowledge of network architecture, routing, MAC protocols, and security aspects. It also prepares students to design and analyze real-world applications like VANETs, sensor networks, and smart systems.

B) EXPECTED SKILL/s –

- Design and analyze wireless ad hoc network architectures and protocols.
- Implement and simulate routing and MAC protocols using network tools.
- Evaluate network performance, energy efficiency, and security issues in ad hoc networks.

C) COURSE OUTCOMES (COs)

The students will be able to

1. Explain the fundamentals, characteristics, applications, advantages, and limitations of wireless ad hoc networks.
2. Describe the architecture, design issues, challenges, and IEEE standards used in wireless ad hoc networks.
3. Analyze and compare different routing protocols (proactive, reactive, hybrid) used in ad hoc networks.

-
4. Explain MAC layer concepts, protocols, and IEEE 802.11 mechanisms in ad hoc networks.
 5. Evaluate energy management, QoS requirements, and security challenges with suitable solutions in ad hoc networks.
 6. Understand emerging technologies and analyze real-world applications and future scope of ad hoc networks

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 Wireless Ad Hoc Networks• Basics of wireless communication.• Characteristics of ad hoc networks.• Differences between wired, infrastructure-based wireless, and ad hoc networks.• Applications of ad hoc networks: Military, Disaster Recovery, Sensor Networks, Vehicular Ad Hoc Networks (VANETs).• Advantages & limitations.	TLO 1.1: Understand the basics of wireless communication. TLO 1.2: Explain the key characteristics of wireless ad hoc networks. TLO 1.3: Differentiate between wired networks, infrastructure-based wireless networks, and ad hoc networks. TLO 1.4: Identify the advantages of ad hoc networks. TLO 1.5: Analyze the limitations, advantages, and applications of ad hoc networks.	6	10	CO1
2	Ad Hoc Network Architecture 2.1 Architectural Styles used in ad hoc systems: Flat, Clustered / Hierarchical. 2.2 Network architecture layers: Physical, MAC, Network, Transport, and Application. 2.3 Functional Blocks of an Ad Hoc Network Node. 2.4 Mobile nodes and topology. 2.5 Challenges in ad hoc networking: Dynamic Topology, Limited Bandwidth, Energy Constraints, Scalability, etc. 2.6 Design issues in ad hoc networks. 2.7 Overview of IEEE 802.11 standards: IEEE 802.11, IEEE 802.15, IEEE 802.16, IEEE 802.20.	TLO 2.1: Understand different architectural styles used in ad hoc networks. TLO 2.2: Explain the layered architecture of ad hoc networks. TLO 2.3: Describe the functional blocks of an ad hoc network node. TLO 2.4: Understand the concept of mobile nodes and dynamic network topology. TLO 2.5: Analyze major design issues in ad hoc networks. TLO 2.6: Explain the basics and differences of IEEE wireless standards.	8	15	CO2
3	Routing Protocols in Ad Hoc Networks 3.1 Importance of routing in ad hoc networks. 3.2 Classification of routing protocols: Proactive protocols, Reactive protocols, Hybrid protocols.	TLO 3.1: Understand the importance of routing in ad hoc networks. TLO 3.2: Explain proactive, reactive, and hybrid routing protocols. TLO 3.3: Compare different routing protocols.	7	10	CO3

	3.3 Proactive protocols: DSDV, OLSR. 3.4 Reactive protocols: AODV, DSR. 3.5 Hybrid protocols: ZRP. 3.6 Comparison of different protocols.	TLO 3.4: Analyze the suitability of routing protocols.			
4	Medium Access Control (MAC) Protocols 4.1 Introduction to MAC – Objectives, Challenges, Roles, Functions Performed by MAC Layer. 4.2 Classification of MAC Protocols: Contention-based MAC, Schedule-based MAC. 4.3 Contention-based MAC: CSMA, MACA. 4.4 Schedule-based MAC: TDMA, FDMA, CDMA. 4.5 IEEE 802.11 MAC Protocol Basics in Ad Hoc Network: Coordination Functions – DCF, PCF, Timing Intervals – SIFS, DIFS, EIFS.	TLO 4.1: Understand the fundamentals of the MAC layer. TLO 4.2: Understand the classification of MAC protocols. TLO 4.3: Explain schedule-based and contention-based MAC protocols. TLO 4.4: Understand the working of IEEE 802.11 MAC protocol in ad hoc networks.	7	15	CO4
5	Energy, QoS & Security in Ad Hoc Networks 5.1 Introduction: Need of Energy Management. 5.2 Power management techniques. 5.3 Quality of Service (QoS): Requirements, QoS Mechanisms. 5.4 Security Challenges and Goals: Confidentiality, Integrity, Authentication, Availability. 5.5 Common attacks and solutions: Black Hole Attack, Wormhole Attack.	TLO 5.1: Understand the need for energy management in ad hoc networks. TLO 5.2: Understand the concept of Quality of Service (QoS) and identify QoS requirements. TLO 5.3: Understand and explain security goals. TLO 5.4: Understand security challenges in ad hoc networks. TLO 5.5: Analyze possible solutions and countermeasures.	6	10	CO5
6	Emerging Trends & Applications of Ad Hoc Network 6.1 Introduction: Concept of Cloud Computing, Edge Computing, Fog Computing. 6.2 Integration with IoT: AI & ML, Sensor Network, MANET, VANET, Industrial Automation, 5G Technology.	TLO 6.1: Understand the concepts of modern computing paradigms. TLO 6.2: Explain the integration of ad hoc networks with IoT systems. TLO 6.3: Understand the role of AI and ML in ad hoc networks.	6	10	CO6

	6.3 Applications and Future Scope.	TLO 6.4: Describe the relationship between ad hoc networks and technologies. TLO 6.5: Identify real-world applications of ad hoc networks. TLO 6.6: Analyze the future scope and emerging trends.			
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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.	Case Study: Design, configuration and troubleshooting of the network in Cisco Packet Tracer.	Design, configure, and troubleshoot a basic wireless network using Cisco Packet Tracer to ensure proper connectivity and performance.	2	CO1
2.	Case Study: Implementation of wireless network scenarios in NS2/ NS3.	Implement and simulate wireless network scenarios using NS2/NS3 to analyze network behavior and performance.	2	CO1
3.	Case study on network performance evaluation using wire shark.	Analyze network performance by capturing and interpreting packets using Wireshark.	2	CO1
4.	Confirmation of a simple ad-hoc network using Cisco Packet Tracer.	Verify and demonstrate the functioning of a simple ad hoc network using Cisco Packet Tracer.	2	CO1, CO2
5.	Simulate mobile ad- hoc network using directional antenna.	Simulate a mobile ad hoc network using directional antennas and analyze its communication performance.	2	CO2, CO3
6.	Simulate a simple vehicular ad-hoc network.	Simulate a simple vehicular ad hoc network (VANET) and analyze communication between moving nodes.	2	CO1, CO3

7.	Simulation of IoT-Based Smart Home Network Using Cisco Packet Tracer.	Simulate and analyze an IoT-based smart home network using Cisco Packet Tracer to ensure effective device communication and control.	2	CO3
8.	Implementing and analyzing any one ad-hoc network routing protocol using NS2/NS3.	Implement and analyze an ad hoc network routing protocol using NS2/NS3 to evaluate its performance.	2	CO4
9.	Create MAC protocol simulation: Implementation for wireless sensor networks.	Implement and simulate a MAC protocol for wireless sensor networks to evaluate its efficiency and performance.	2	CO4
10.	Investigate network protocols by capturing and studying packets using Wireshark.	Investigate and analyze network protocols by capturing and studying packets using Wireshark.	2	CO4, CO5

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

Micro Project:

Design and simulate a Wireless Ad Hoc Network for Disaster Management System using Cisco Packet Tracer / NS2 / NS3.

OR Design a Smart Home IoT Network using Ad Hoc Communication and analyze performance.

Assignment

Solve assignment covering all COs given by teacher

Specific Learning Activities / Skills Development (SLA):

Simulation of ad hoc network using Packet Tracer / NS2 / NS3.

Packet capturing and analysis using Wireshark.

Performance evaluation (throughput, delay, packet loss).

Study and presentation on IoT, AI/ML, 5G integration with Ad Hoc Networks.

Practice network troubleshooting and configuration basics.

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 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.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe consistent.

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	Network simulation software: Cisco Packet Tracer / NS2 / NS3	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 Wireless Ad Hoc Networks	6	4	4	2	10
2.	Ad Hoc Network Architecture	8	6	5	4	15
3.	Routing Protocols in Ad Hoc Networks	7	3	4	3	10
4.	Medium Access Control (MAC) Protocols	7	5	6	4	15
5.	Energy, QoS & Security in Ad Hoc Networks	6	3	4	3	10
6.	Emerging Trends & Applications of Ad-Hoc Network	6	3	4	3	10
	Total	40	24	27	19	70

ASSESMENT TOOL –

Formative assessment

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

Summative Assessment

- End semester examination, Lab performance, Viva voce

LEARNING RESOURCES –

BOOKS

Sr. No.	Author	Title	Publication (with year)
1	#Behrouz A.Forouzan	Data Communication and networking(2 nd Edition)	TMG,2 nd Ed;2003
2	#A.S .Tanenbaum	Computer Networks	PHI,4 th Ed;2002
3	C. Siva Ram Murthy, B. S. Manoj	Ad Hoc Wireless Networks: Architectures and Protocols	Pearson Education, 2004
4	William Stallings	Wireless Communications and Networking	Pearson Education, 2005
5	Prasant Mohapatra, Srikanth Krishnamurthy	Mobile Ad Hoc Networking: Imperatives and Challenges	Cambridge University Press, 2004
6	Feng Zhao, Leonidas Guibas	Wireless Sensor Networks: An Information Processing Approach	Morgan Kaufmann, 2004

WEBSITES LINKS

Sr. No.	Link / Portal
1	http://www.cse.iitk.ac.in/users/dheeraj/cs425/index.html
2	www.networktutorials.info
3	http://www.mhhe.com/engcs/compsci/forouzan/dcn/student/olc/
4	www.datacottage.com
5	https://www.geeksforgeeks.org/computer-networks
6	https://nptel.ac.in/
7	https://www.wireshark.org/

Note:

Teachers are requested to check the Creative Common license status / financial implication of the suggested online educational resources before use by the students.

CO-PO Matrix –

Course Outcome	Program Outcome							Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	1	-	-
CO2	3	2	2	1	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	3	-	-
CO4	3	2	2	2	-	-	-	2	1	-
CO5	2	3	2	2	2	-	1	2	-	-
CO6	2	2	2	1	3	2	3	1	2	2

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

Diploma Programme	Computer Engineering And IoT
Course Name	Iot In Robotics
Course code	R23CI2612
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	Min	Max	Min	Max	Min	Max	Min		
3	-	4	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.

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

@\$ Internal Online Examination

A) RATIONALE

IoT in Robotics is a powerful, flexible, and efficient technology. IoT enables robots to connect with sensors, control boards, and cloud platforms through the internet. It allows realtime data collection, monitoring, and remote control of robotic systems. IoT supports various communication technologies such as Wi-Fi, Bluetooth, ZigBee, and LoRa. IoT makes robots smarter, more reliable, and easier to manage. IoT-enabled robotics is used in industrial automation, smart agriculture, healthcare, surveillance, drones, and many other applications across different platforms.

B) EXPECTED SKILL/s –

Students will be able to identify and explain the basic components of robotic systems used in practical applications.

C) COURSE OUTCOMES (COs)

CO 1-Understand the definition, scope, and applications of robotics in various fields.

CO 2 -Identify and explain the basic components of a robotic system including motors, sensors, and control boards.

CO 3 -Select and interface different types of motors and motor driver modules for robotic applications.

CO 4 -Develop basic robotic systems using microcontrollers (Arduino) and perform input/output operations.

CO 5 -Analyse power supply and battery requirements and apply safety practices in robotic systems.

CO 6 -Implement communication interfaces and IoT concepts for monitoring and controlling robotic systems, including drones.

D) COURSE CONTENT

Sr. No	Topics and Sub-topics	Unit Outcome UO / Learning Outcome LO	CL Hrs / week	FA TH Max	CO Mapped
1	INTRODUCTION TO ROBOTICS 1.1 Definition and Scope of Robotics 1.2 Applications of Robotics 1.3 Basic Components of a Robot System: - Motors Used in Robotics DC Motors Servo Motors Stepper Motors 1.4 Motor Selection Criteria	LLO 1.1 Understand robotics definition and scope. LLO 1.2 Identify applications of robotics. LLO 1.3 Describe robot components and motor types.	7	10	CO1
2	Motor Driver Modules 2.1 Types of Motor Drivers 2.2 Interfacing Motors with Driver Modules 2.3 Direction and Speed Control Control Boards, Microcontroller Basics (Arduino), Overview of Arduino and microcontrollers - Architecture and working principle 2.4 Input and Output Pins 2.5 Role of Control Boards in Robotics	LLO 2.1 Explain motor driver types and interfacing. LLO 2.2 Control motor direction and speed. LLO 2.3 Describe Arduino basics and control board role.	7	10	CO2
3	Power Supply & Battery Systems 3.1 Importance of power supply in robotics 3.2 Types of Batteries Used: Dry	LLO 3.1 Understand battery types and usage. LLO 3.2 Calculate	8	15	CO3

	cell batteries -Rechargeable batteries (Li-ion, Li-Po, NiMH)	voltage/current needs.				
	3.3 Voltage and Current Requirements: - Voltage ratings of motors and boards - 3.4 Current requirements and power calculations- Matching power supply to system needs 3.5 Battery Safety and Handling: Safe charging/discharging - Short-circuit and overcurrent protection - Storage and handling	LLO 3.3 Implement battery safety practices.				
4	Communication Devices and Interfaces in Robotics 4.1 Introduction: - Need for communication in robots - Types: Wired & Wireless, Block diagram of communication system 4.2 Wired Communication: - Serial communication (UART) I2C, SPI, Applications 4.3 Wireless Technologies: - Bluetooth - Wi-Fi - ZigBee - LoRa	LLO 4.1 Explain communication types and needs. LLO 4.2 Understand wired interfaces. LLO 4.3 Identify wireless communication tech.	8	15	CO4	
5	Introduction to Drones (UAVs) and Applications 5.1 Introduction: - Definition, history, and types (Fixed-wing, Rotary-wing) - Basic working principle 5.2 Main Components: - Frame and structure - Motors and propellers - Electronic Speed Controller (ESC) - Flight controller - Battery and power system 5.3 Sensors: - Accelerometer - Gyroscope - GPS module - Altimeter/Barometer - Role in stabilization 5.4 Applications: - Aerial photography/videography - Agriculture - Surveillance and security - Disaster management -	LLO 5.1 Understand drone basics and components. LLO 5.2 Describe sensors and their roles. LLO 5.3 Identify drone applications.	7	10	CO5	

	Industrial inspection					
6	IoT-enabled Robotic Systems 6.1 Remote monitoring and control Real-time data-driven actuation 6.2 Multi-Robot and Drone Coordination 6.3 Drone swarm basics and coordinated flight Applications in warehouse, agriculture, surveillance 6.4 Emerging Trends Autonomous robots AI-assisted robotics (Machine learning, vision systems) Smart agriculture and smart cities Drones for delivery, inspection, disaster management 6.5 Case Studies IoT mobile robot for logistics Drone-based crop monitoring Smart security robot Battery-optimized robotic arm	LLO 6.1 Integrate IoT in robotics. LLO 6.2 Understand multi-robot coordination. LLO 6.3 Explore emerging robotic trends. LLO 6.4 Analyse case studies.	8	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	Introduction to Robotics: Identify and assemble basic components	Understand robotics scope, applications, and components	2	CO1
2	Study and interfacing of DC, Servo, and Stepper motors	Operate and select appropriate motors for robotics	4	CO2
3	Motor driver modules: Interfacing with Arduino	Control direction and speed of motors	2	CO3
4	Write Arduino program to control a motor	Implement motor control using code	2	CO3
5	Sensor interfacing with Arduino: IR, Ultrasonic	Read and process sensor data	2	CO3
6	Implement obstacle avoidance / line following robot	Apply sensor feedback for robotic movement	2	CO3
7	Power supply and battery setup for robotic system	Connect and test voltage/current requirements	2	CO4
8	Safety precautions and troubleshooting of power systems	Handle batteries and prevent short circuits	2	CO4
9	Communication module interfacing: Bluetooth/Wi-Fi	Enable wireless control and data exchange	2	CO4

10	IoT-enabled robot project: Remote monitoring	Implement cloud connectivity and remote control	2	CO5
11	Multi-robot communication / coordination setup	Enable communication between multiple robots	2	CO5
12	Drone basic flight: Take-off, landing, and hovering	Understand UAV control and sensor stabilization	2	CO6
13	Drone mission practice: Path following / obstacle navigation	Apply drone sensors for autonomous movement	2	CO6
14	Mini-project demonstration / Final integration of robot/drone system	Integrate all components and demonstrate working system	2	CO6

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

Mini project:

Design and develop a simple robotic system (line follower robot / obstacle avoidance robot / IoT-based monitoring robot / basic drone model) using microcontroller, sensors, and actuators.

Assignment:

- Solve assignments covering all Course Outcomes (COs) related to robotics, motors, control boards, power systems, communication interfaces, IoT, and drone applications.

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 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.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations

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	Microcontroller Board – (Arduino UNO / Nano or equivalent)	All
3	Motor Driver Module – (L298N / L293D or equivalent)	2, 3
4	Motors – (DC motor, Servo motor, Stepper motor)	2
5	Sensors – (IR sensor, Ultrasonic sensor, Temperature sensor, etc.)	3, 5
6	Power Supply and Batteries – (Dry cell / Li-ion / Li-Po batteries with charger)	4
7	Communication Modules – (Bluetooth, Wi-Fi, ZigBee, LoRa modules)	5

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
8	Drone Kit / UAV Trainer Kit – (Basic educational drone kit)	6
9	Connecting Accessories – (Breadboard, jumper wires, resistors, LEDs)	All
10	Software Tools – (Arduino IDE / Simulation software such as Proteus, Tinker cad)	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 ROBOTICS	7	3	4	3	10
2.	Motor Driver Modules	7	3	4	3	10
3.	Power Supply & Battery Systems	8	3	6	6	15
4.	Communication Devices and Interfaces in Robotics	8	3	4	3	10
5.	Introduction to Drones (UAVs) and Their Applications	7	3	6	6	15
6.	IoT-enabled Robotic Systems	8	3	4	3	10
		45	18	28	24	70

I) ASSESSMENT METHODS

Formative Assessment:

1. Continuous assessment based on process and product-related performance indicators.
2. Each practical will be assessed considering **60% weightage to process** (planning, implementation, teamwork) and **40% weightage to product** (working functionality, accuracy).
3. Term work will be evaluated on a **continuous assessment basis** throughout the semester.

Summative Assessment:

1. End semester examination.
2. Laboratory performance evaluation.
3. Viva voce based on practical understanding and project demonstration.

J) LEARNING RESOURCES –

- **BOOKS**

Sr. No	Author	Title	Publisher with ISBN Number
1	John J. Craig	Introduction to Robotics: Mechanics and Control	Pearson, ISBN: 978-0133489796
2	Robert J. Schilling	Fundamentals of Robotics: Analysis and Control	Prentice Hall, ISBN: 978-0133496596
3	Mark Ciampa	Learning Robotics Using Python	Packt Publishing, ISBN: 978-1789346438
4	Thomas R. Kurfess	Robotics and Automation Handbook	CRC Press, ISBN: 978-0849320147
5	Saeed B. Niku	Introduction to Robotics: Analysis, Systems, Applications	Wiley, ISBN: 978-1118884035
6	Graeme A. Taylor	Robotics for Beginners: Build, Program, and Control Robots	Independently Published, ISBN: 978-1794141826

• **WEBSITES LINKS**

Sr. No	Link / Portal	Description
1	Arduino Official	Tutorials, reference for Arduino programming and hardware interfacing
2	Tinkercad Circuits	Online simulation platform for robotics and electronics
3	ROS (Robot Operating System)	Open-source platform for robot software development
4	All About Circuits	Electronics and robotics tutorials, theory, and projects
5	IEEE Xplore	Research papers and technical articles on robotics and automation
6	Coursera Robotics Courses	Online learning modules and practical exercises in robotics

Note:

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

CO-PO MATRIX

COURSE OUTCOMES	PROGRAM OUTCOMES							PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO	PSO	PSO
CO 1	3	2	1	-	1	2	1	-	1	2
CO 2	3	2	2	1	2	1	-	2	1	2
CO 3	3	3	3	2	2	1	-	2	2	2
CO 4	3	3	3	2	3	1	-	2	2	3
CO 5	2	3	2	2	2	3	3	1	1	3
CO 6	3	3	3	2	3	2	1	2	3	3

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

*PSOs are to be formulated at institute level.

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Advanced Java Programming
Course code	R23CI2613
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		
C L	T L	L L					FA TH		SA-TH		Total		FA-PR		SA-PR			SLA	
							Max	Min	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		

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.

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 –

After completing this course, students will be able to:

- Design GUI applications using Java Swing
- Implement event-driven programming
- Develop database-connected applications using JDBC
- Create client–server and network-based applications
- Build distributed applications using Java RMI
- Develop dynamic web applications using JSP and MVC
- Apply object-oriented concepts to real-world problems

C) COURSE OUTCOMES (COs)

The students will be able to

1. Understand the concept of Java Swing and to Swing applications using controls/components.

2. Implement event-driven programming with Swing event handling, and connect Java applications to databases using JDBC.
3. Understand network programming concepts, Java networking classes, and remote communication using Java RMI to develop client-server and distributed applications.
4. Understand the architecture, lifecycle, scripting elements, directives, implicit objects, and exception handling in Servlet and JSP to create dynamic, well-structured web applications following the MVC pattern.
5. Understand the core concepts of the Spring Framework, Spring Boot, and Spring MVC, and build web applications using the MVC pattern and RESTful services.
6. Understand the fundamentals of Hibernate ORM, SOAP and RESTful web services for building scalable and interoperable web applications.

D) COURSE CONTENT

Unit. No.	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FATH MAX.	CO Mapped
1	1 Swing and GUI Controls 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, JTextField, JTextArea, JCheckBox, JRadioButton, JTable, JList, JScrollBar, JMenuItem & JMenu, JProgressBar, JTree, JColorChooser, JToggleButton, JTabbedPane, JDialog, JPanel, JFileChooser, JFrame, JScrollPane, JComponent, JLayeredPane	TLO1.1 Understand the concept, features, applications of Java Swing: TLO 1.2 Differentiate between AWT and Swing TLO 1.3 Understand Java Foundation Classes (JFC) TLO1.4 Identify and use various Swing controls/widgets	8	15	CO1

2	2. Java Layouts, Events and JDBC 2.1 Java LayoutManagers:- 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. Networking and RMI 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 Sockets, Difference between TCP and UDP, 3.2 Classes for Networking:- The net package, URL Class, URL Connection, HttpURLConnection, 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	TLO 3.1 Understand core networking concepts such as IP address, protocol, port number, URL, MAC address, and sockets. TLO 3.2 Use classes from the java.net package such as URL, URLConnection, HttpURLConnection, and InetAddress for basic and web-based communication. TLO 3.3 Implement client-server communication using Socket, ServerSocket, and DatagramSocket classes. TLO 3.4 Understand concept and architecture of Java RMI TLO 3.5 Understand the role of RMI Registry and how remote objects are registered and looked up TLO 3.6 Create simple distributed applications using RM	6	10	CO3

4	.Servlets and JSP 4.1 Servlets : Overview of Servlets, CGI (Common Gateway Interface), Web Terminology, Servlet API, Servlet Interface, GenericServlet class, HttpServlet class, Life Cycle of a Servlet, Steps to create a servlet example, Working of Servlet, 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	TLO 4.1 Understand the fundamentals and architecture of Java Servlets TLO4.2 Understand the structure and lifecycle of JSP pages, and differentiate them from Servlets TLO4.3 Apply JSP scripting elements and directives such as scriptlet, expression, declaration tags, and directives like page, include, and taglib to create dynamic web pages. TLO 4.4 Utilize implicit JSP objects (request, response, session, application, config, etc.) to handle user input, session tracking, and web application control flow. TLO 4.5 Use JSP action elements like jsp:forward, jsp:include, and jsp:useBean for dynamic content generation and object management. TLO 4.6 Implement exception handling mechanisms in JSP to create robust and error-tolerant web applications.	8	15	CO4
5	5. Spring and MVC Frameworks 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.	TLO 5.1 Understand the core principles of Spring, including Inversion of Control (IoC) and Dependency Injection (DI). TLO 5.2 Understand the architecture and modules of the Spring Framework TLO 5.3 Understand the architecture and key features of Spring Boot, and create RESTful services using built-in annotations such as @RequestMapping	6	10	CO5

	Spring Boot, Spring Boot Architecture Annotations : @Autowired, @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 of Spring MVC	TLO 5.4 Use core Spring annotations such as @Autowired, @Component, and @RequestMapping for component scanning, dependency injection, and request handling. TLO 5.5 Build simple REST APIs using Spring Boot, implementing HTTP GET and POST methods with minimal configuration. TLO 5.6 Understand the Spring MVC framework and its architecture, including the request flow and components like controllers, views, and models.			
6	6. Hibernate and Web Services 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 architecture and key components of Hibernate. TLO 6.2 Differentiate between the types of Web Services (SOAP and REST) and identify the key components and features of each. TLO 6.3 Understand structure, advantages, and disadvantages of SOAP-based web services TLO 6.4 Understand design principles, benefits, and limitations of RESTful web services TLO 6.5 Differentiate between Compare SOAP and REST	6	10	CO6

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

Sr. No	Laboratory Experiment / Practical Title	Practical / Tutorial / Laboratory Learning Outcome (LLO)	No. of Hrs	Relevant COs
1.	Develop a Java Swing application by extending JFrame and add basic controls like	Understand Swing basics and create GUI using JFrame and basic components	2	CO1

	JButton, JLabel and JTextField			
2.	Design a Swing form using JTextField and JTextArea to accept and display user input	Design interactive forms and handle user input using Swing controls	2	CO1
3.	Create a Swing application using JCheckBox to select multiple options	Implement multiple selection options using JCheckBox	2	CO1
4.	Develop a Swing program using JRadioButton and ButtonGroup	Implement single selection functionality using radio buttons	2	CO1
5.	Design a Swing GUI using JPanel to organize multiple components	Organize GUI components effectively using JPanel	2	CO1
6.	Implement event handling in Swing using ActionListener	Handle user actions through event-driven programming	2	CO1
7.	Develop a Swing application using JTable to display tabular data	Display and manage structured data using JTable	2	CO2
8.	Create a Swing program using JList and handle item selection events	Implement list-based data selection and event handling	2	CO2
9.	Implement a Swing application using JScrollPane	Display large content efficiently using scroll panes	2	CO2
10.	Design a Swing application using JMenuBar, JMenu and JMenuItem	Create menu-driven GUI applications	2	CO2
11.	Create a GUI using JTabbedPane with multiple tabs	Organize multiple screens using tabbed panes	2	CO2
12.	Design a Swing application demonstrating FlowLayout, BorderLayout and GridLayout	Understand and implement layout managers in Swing	2	CO3
13.	Create a Java Swing program using CardLayout	Implement multiple screen navigation using CardLayout	2	CO3
14.	Implement event handling using event listeners and adapter classes	Apply advanced event handling techniques	2	CO3
15.	Write a Java program to connect Java application with MySQL/Oracle using JDBC	Establish database connectivity using JDBC	2	CO3
16.	Develop a JDBC application to INSERT records using Swing form	Perform database insertion operations using JDBC	2	CO3
17.	Write a JDBC program to SELECT and display records in Swing	Retrieve and display database records in GUI	2	CO3
18.	Implement a TCP client-server application using Socket and ServerSocket	Understand TCP-based client-server communication	2	CO4
19.	Develop a UDP communication program using DatagramSocket	Implement connectionless communication using UDP	2	CO4
20.	Write a Java program using InetAddress, URL and	Work with Java networking utility classes	2	CO4

	URLConnection			
21.	Implement a simple RMI application	Demonstrate remote method invocation in Java	2	CO4
22.	Develop a JSP application using directives and action tags	Understand JSP directives and action elements	2	CO5
23.	Develop a JSP program using implicit objects	Process form data and manage sessions using JSP	2	CO5
24.	Develop a Java application using Hibernate ORM for database persistence and expose the data using a RESTful Web Service	Understand Hibernate architecture and ORM concepts.	2	CO6

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

Mini project

- 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 suggestivelistingsisapplicabletoTutorialsandmaybeconsideredforFA-

F) 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

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

Unit No.	Unit Title	Teaching Hours	R Level	U Level	A Level	Total Marks
1	Swing and GUI Controls	8	3	4	3	10
2	Java Layouts, Events and JDBC	9	3	6	6	15
3	Networking and RMI	7	3	4	3	10
4	Servlets and JSP	8	5	5	5	15
5	Spring and MVC Frameworks	6	2	3	5	10
6	Hibernate and Web Services	7	3	4	3	10
Total	—	45	18	28	24	70

H) 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**
 - 1) End semester examination, Lab performance, Viva voce

I) LEARNING RESOURCES –

- **BOOKS**

Sr. No.	Author	Title	Publisher with ISBN Number
1	Herbert Schildt	<i>Java: The Complete Reference</i>	McGraw-Hill Education, ISBN: 978-9354608180
2	E. Balagurusamy	<i>Programming with Java</i>	McGraw-Hill Education, ISBN: 978-9353162348
3	Kathy Sierra & Bert Bates	<i>Head First Java</i>	O'Reilly Media, ISBN: 978-9352132779

- **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

Note:

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

J) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

Name & Signature:

(Programme Head)

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Software Engineering
Course Code	R23CI2610
Course Category	DSC
Credits	2

LEARNING AND ASSESSMENT SCHEME –

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(Base d on LL&TL)				Based on Self Learning				Total Marks
	CL	TL	LL					FA TH	SA-TH	Total		FA-PR		SA-PR		SLA				
										Max	Min	Max	Min	Max	Min	Max	Min			
-	4	-	2	-	6	2	3	30	70	100	40	25	10	25#	10	-	-	150		

Abbreviations:

IKS - Indian Knowledge System , CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SL - Self-Learning ,NLH- Notional Learning Hrs /Week, FA - Formative Assessment, SA - Summative Assessment, PR-Practical, SLA - Self Learning Assessment.

A) RATIONALE

Software Engineering introduces a systematic and professional approach to the design, development, testing, deployment, and maintenance of software systems. The course emphasizes the application of engineering principles, structured methodologies, established standards, and industry best practices for effective software development. It aims to develop students' competencies in adopting disciplined and process-oriented techniques to ensure the delivery of software that is high-quality, reliable, scalable, and maintainable.

B) EXPECTED SKILL/s –

Ability to apply engineering principles and structured methodologies in software development.

COURSE OUTCOMES (COs)

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

CO1 – Select an appropriate software development process model for a given project. CO2

– Develop a professionally structured Software Requirement Specification (SRS).

CO3 – Produce well-defined software design models using suitable techniques.
 CO4 – Apply effective planning and cost estimation methods for software development. CO5
 – Implement project management practices throughout the software lifecycle.
 CO6 – Apply software quality assurance principles to ensure dependable and maintainable software.

C) COURSE CONTENT

Sr. No	Topics And Sub Topics	Unit Outcome UO / Learning Outcome LO	CL Hrs / week	FA TH Max	CO Mapped
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; 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 Select the attributes that match with standards for the given software application. TLO 1.2 Suggest the relevant software solution for the given problem. TLO 1.3 Select the relevant software process model for the given problem. TLO 1.4 Suggest the relevant activities in Agile Development Process.	10	15	CO1
2	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 Apply principles of software engineering for the given problem. TLO 2.2 Select the relevant requirement engineering steps for the given problem. TLO 2.3 Construct the Requirement Engineering model for the given problem. TLO 2.4 Prepare SRS for the given problem.	7	10	CO2
3	Design Engineering: Design Process, Design concepts (Abstraction, Modularity, Information hiding, Functional Independence, Refinement), Design model (Data Design, Architecture Design, Interface Design, Component level Design) Software architecture- Control Architecture, Structural Partitioning,	TLO 3.1 Identify the elements of analysis model for the given software requirements. TLO 3.2 Apply the specified design concepts for software requirements modeling. TLO 3.3 Construct software design using standard design notation. TLO 3.4 State the purpose of	7	10	CO3

	Functional Independence (Cohesion and Coupling). Architectural styles: Data centered architectures, Data flow architectures, layered architectures.	software testing. TLO 3.5 Draw Use-Case, Class Diagrams, Sequence Diagrams for software project. TLO 3.6 Explain basic types of software testing.			
4	Software Project Cost Estimation The Management Spectrum – 4P's. Metrics for Size Estimation: Line of Code (LoC), Function Points (FP). Project Cost Estimation Approaches. COCOMO (Constructive Cost Model). Risk Analysis and Management: Risk identification, Risk assessment, Risk management and monitoring, Risk Refinement and Mitigation, RMMM Plan.	TLO 4.1 Explain the management spectrum for software project. TLO 4.2 Estimate size of software product. TLO 4.3 Estimate cost of software product using the empirical method. TLO 4.4 Compute size of the given software using COCOMO model. TLO 4.5 Apply RMMM strategy in Identified risks for any software development problem.	7	10	CO4
5	Software Project Management Project Scheduling: Basic principles, Work breakdown structure, Activity network Project Tracking: Timeline charts, Earned Value Analysis, Gantt Charts. Scheduling techniques: Critical Path Method(CPM), Program Evaluation Review Technique(PERT)	TLO 5.1 Apply CPM/PERT scheduling technique for software project. TLO 5.2 Construct timeline chart / Gantt chart to track progress of the given software project.	7	10	CO5
6	Software Quality Assurance Software Quality Management vs. Software Quality Assurance. Phases of Software Quality Assurance: Planning, activities, audit, and review. Quality Evaluation standards: Six Sigma, CMMI: Levels, Process areas.	TLO 6.1 Differentiate between Software Quality Management and Software Quality Assurance. TLO 6.2 Apply the phases of Software Quality Assurance in software development project TLO 6.3 Apply software quality evaluation standards.	10	15	CO6

D) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK (Any 12)

Sr.No	Unit no	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs
1	1	Write a problem statement and finalize the project title with a bounded scope.	2	1
2	1	Select a suitable software development process model and list its activities and tasks.	2	1
3	1	Gather requirements and apply Requirement Engineering principles.	2	2
4	3	Prepare the Software Requirement Specification (SRS) document.	2	2
5	3	Write use cases and create the Use-Case Diagram.	2	3
6	3	Draw the Activity Diagram to represent the workflow of the system.	2	3
7	3	Create Data Flow Diagrams (DFD), Decision Tables, and the Entity-Relationship Diagram.	2	4
8	4	Draw the Class Diagram, Sequence Diagram, and State Transition Diagram.	2	4
9	4	Prepare a Decision Table for key decision scenarios.	2	4
10	5	Design test cases based on the SRS document.	2	5
11	5	Prepare Black Box Test Cases to evaluate system functionality.	2	5
12	5	Identify potential project risks and develop the RMMM (Risk Management, Mitigation, and Monitoring) Plan.	2	5

Note : Out of above suggestive LLOs -

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

E) 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, Searchability and Online Presence, Demonstrating Growth and Progress, Career Advancement and Networking and Prepare complete technical document.
- Apply the principles of software engineering for Chatbot Application to create an intelligent chatbot to enhance customer support processes, providing efficient and personalized assistance and Develop technical document.

- c. 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.

F) LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr.No.	Equipment/ Instrument with Broad Specifications
1	Software Project Management Tools: Open source Software such as Jira.
2	Software Design tools :Project risk manager
3	Software Design tools: Free Use Case Diagram Creator
4	Software Design tools: Draw.io, Decision Table Maker, Tiny tools
5	Hardware: Personal computer, processor i3 and above, RAM minimum 4 GB
6	Operating system: Windows 10 and above

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

UNIT NO	UNIT TITLE	Aligned COs	DISTRIBUTION OF THEORY MARKS			
			R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Introduction to Software Engineering	CO1	4	4	2	10
2	Requirement Engineering	CO2	2	4	4	10
3	Design Engineering	CO3	4	7	4	15
4	Software Project Cost Estimation	CO4	5	5	-	10
5	Software Project Management	CO5	2	5	8	15
6	Software Quality Assurance	CO6	2	4	4	10
Grand Total			19	29	22	70

Legends: R = Remembrance; U= Understanding; A= Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students

and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

ASSESSMENT TOOL –

Formative assessment (Assessment for Learning)

For laboratory learning 25 marks

- Each practical will be assessed considering - - 60% weightage to process and - 40% weightage to product
- Two formative assessment tests of for 30 marks and average of two unit tests.

Summative Assessment (Assessment of Learning)

End semester assessment of 25 marks for laboratory learning

- End semester assessment of 70 marks

SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No.	Title of Book	Author	Publisher
1	Software Engineering: A practitioner's approach	Roger S. Pressman & Bruce R. Maxim	McGraw Hill Higher Education, New Delhi, (Ninth Edition) ISBN 93-5532-504-5
2	Software Engineering Concepts	Richard Fairly	McGraw Hill Education New Delhi -2001, ISBN-13: 9780074631218
3	Software Engineering: Principles and practices	Deepak Jain	Oxford University Press, New Delhi ISBN 9780195694840
4	Software Testing: Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	PEARSON Publisher: Pearson India 2007, ISBN: 978-81-7758-121-8

LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.geeksforgeeks.org/software-engineering-introduction-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

CO-PO MATRIX

COURSE OUTCOMES	PROGRAM OUTCOMES							PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO	PSO	PSO
CO 1	2	3	2	1	2	1	1	1	1	2
CO 2	2	3	3	2	2	1	-	-	2	2
CO 3	2	3	3	2	2	-	-	-	2	2
CO 4	2	3	2	2	2	1	1	-	1	3
CO 5	2	2	3	2	2	2	1	1	2	3
CO 6	2	2	2	3	2	2	1	1	2	3

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

*PSOs are to be formulated at institute level.

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

Diploma Programme	Computer Eng
Course Name	YOGA AND MEDITATION
Course code	R23EX4701
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
C L	T L	L L					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
									Max	Max	Max	Min	Max	Min	Max	Min	Max
-	-	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

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 .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Practice basic Yoga and Pranayama in daily life

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO2 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO3 - Follow healthy diet and hygienic practices for maintaining good health.

D) COURSE CONTENT –

Unit. No.	Topics and Sub-Topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FA-TH MAX.	CO Mapped
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E) PRACTICAL (BASED ON LL & TL) ASSESMENT WORK –

Lab. Learning Outcome	Sr. No.	Laboratory /Practical Titles	Unit No./CO	Hrs.
LLO 1.1 Practice warming up for Yoga.	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.	5	CO1
LLO 2.1 Practice Surya Namaskar	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.	7	CO1 CO2
LLO 3.1 Practice basic Asanas	3	Lab Exp: 4 Perform Sarvangasana, 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	8	CO2
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalabhati Pranayam Kriya Lab Exp: 10 Practice Bhramary Pranayam.	5	CO3
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	5	CO3

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) 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
CO1	-	-	-	-	1	-	1
CO2	-	-	-	-	1	1	1
CO3	-	-	-	-	1	-	1

K) LEARNING RESOURCES –

• BOOKS

SR. NO.	AUTHOR	TITLE	PUBLISHER
1	Swami Vivekananda Patanjali's Yoga Sutras Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017	2	Luisa Ray, Angus Sutherland Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me Vital Life Books (2022) ISBN-13?: ? 978-1739737009
3	Swami Saradananda Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your Watkins Publishing (2019) ISBN-13?: ? 978-1786782786	4	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW The Relaxation and Stress Reduction Workbook A New Harbinger Self-Help Workbook (2019)
5	Ann Swanson Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice ISBN-13?: ? 978-1465479358		
1	Swami Vivekananda Patanjali's Yoga Sutras Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017	2	Luisa Ray, Angus Sutherland Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me Vital 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 Yog	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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering
Course Name	Social and Life Skills
Course Code	R23CI4601
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
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	-	-	-	-	-	-	-	-	-	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 1.1 Meaning 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 5.3 Critical 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
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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

SUGGESTED WEIGHTAGE FOR ASSESSMENT PURPOSE (Specification Table)

–

G) ASSESMENT TOOL –

- **Formative assessment**
 - 1) –
- **Summative Assessment**
 - 1) –

H) CO-PO Matrix –

Course Outcomes (Cos)	Programme Outcomes (Pos)						
	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
CO1					03	03	
CO2					02	02	02
CO3	01	01	01		03	02	02
CO4		01	01	01	03	02	02
CO5		02		01	03	02	02
CO6	02	02		01	03	02	02

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 - 9388691830 - 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/](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>

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering & IoT
Course Name	Indian Constitution
Course code	R23CI4602
Course Category	VEC
Credits	1

LEARNING AND ASSESSMENT SCHEME –

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	Min	Max	Min	Max	Min	Max	Min		
1	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

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.
7. * Self learning includes micro project / assignment / other activities.

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, futuristic 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.

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.

C) 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.			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.			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.			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 4.2 Elaborate the elements of Centre-State Relationship			CO4
5	Constitutional Amendments • Amendment procedure and significance of key amendments. • Impact of amendments on governance and democracy.	TLO 5.1 Enlist the constitutional amendments. TLO 5.2 Analyze the purposes of various amendments..			CO5

	Judicial review of constitutional amendments.				
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.			CO6

8. PRACTICAL (BASED ON LL & TL) ASSESMENT WORK (Any 12)

Sr.No	Unit no	Laboratory Experiment / Practical Titles/Tutorial Titles	Number of hrs.	Relevant COs

9. 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 enrolment 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 contended 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 was a tribal woman who succumbs to multiple patriarchies. 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 judicious 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.

1. LABORATORY LEARNING EQUIPMENTS REQUIRED –

Sr. No.	Equipment/ Instrument with Broad Specifications
	-

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

UNIT NO	UNIT TITLE	DISTRIBUTION OF THEORY MARKS			
		R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Architecture of the constitution and Preamble	0	0	0	0
2	Fundamental rights	0	0	0	0
3	Directive principles	0	0	0	0
4	Constitutional Government and Democracy	0	0	0	0
5	Constitutional Amendments	0	0	0	0
6	Electoral Literacy and Votes Role	0	0	0	0

Legends:

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

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

3. ASSESMENT TOOL –

- **Formative assessment (Assessment for Learning)**

Assignment, Self-learning and Terms work Seminar/Presentation

- **Summative Assessment (Assessment of Learning)**

4) CO-PO Matrix –

CO's	PO1 Basic knowledge discipline specific knowledge	PO2 problem analysis	PO3 Design/ development	PO4 Engineering Tools Experimentation and testing	PO5 Engineering practices for society, sustainability &	PO6 Project	PO7 Life long learning	PSO1 Demonstrate basic analog and digital circuits using modern electronic tools	PSO2 Troubleshoot and monitor specified electronic system
CO1	1				2				
CO2	1				2				
CO3	1	2			2		1		
CO4	1			1	2				
CO5	1				2				
CO6	1				2				

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

5) LEARNING RESOURCES:

• BOOKS

Sr. No	Author	Title	Publisher with ISBN Number
	Subhash C. Kashyap	Indian Constitution	National Book Trust, New Delhi.
	Dr. G. B. Reddy & Mohd. Suhaib	Constitution of India and Professional Ethics	Dreamtech Press
	B.Z. Fadia & Kuldeep Fadia	Indian Government & Politics	Lexis Nexis, New Delhi
	Laxmikanth	Indian Polity	McGraw Hill. 5th Edition
	B.K. Sharma	Introduction to the constitution of India	PHI, New Delhi, 6th edition, 2011, ISBN:8120344197
	P.M. Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)
	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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411001

Diploma Programme	Computer Engineering & IoT
Course Name	Problem-Solving and Ethics
Course code	R23CI4603
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				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	Min	Max	Min	Max	Min	Max	Min	
-	-	2	2	4	2	-	-	-	-	-	-	-	-	25	10	25	

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.

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

A) RATIONALE

This course aims to develop structured problem-solving skills, logical reasoning, and analytical thinking among diploma students, enabling them to identify, analyze, and resolve real-life and engineering problems effectively. It introduces students to various problem-solving techniques and decision-making tools that are essential for software development, system design, and IoT-based applications.

Through activity-based learning, case studies, group discussions, and project work, the course bridges the gap between theory and practice. It prepares students to become

responsible, ethical, and competent professionals, capable of making informed decisions and contributing positively to organizations and society.

B) COURSE OUTCOMES (COs)

The students will be able to

CO1: Identify and classify problems based on their nature and complexity, and apply a systematic problem-solving approach to analyze real-life and engineering-related situations.

CO2: Apply appropriate problem-solving techniques and tools such as brainstorming, flowcharts, decision trees, root cause analysis, and SWOT analysis to develop effective and feasible solutions.

CO3: Use logical reasoning and analytical thinking skills to solve problems involving patterns, sequences, and logical relationships in technical and real-world contexts.

CO4: Analyze ethical issues and moral dilemmas using ethical theories and structured ethical decision-making processes in personal, professional, and technological environments.

CO5: Demonstrate professional ethics, integrity, teamwork, and social responsibility while responding to workplace scenarios related to Computer Engineering and IoT domains.

CO6: Apply problem-solving and ethical reasoning skills to a real-world case or project and communicate solutions effectively through presentations, reports, and peer discussions.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)/ Activities	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	UNIT 1: Introduction to Problem-Solving 1.1 Meaning and importance of problem-solving in engineering and technology 1.2 Types of problems: structured and unstructured 1.3 Systematic problem-solving approach: 1.3.1 Understanding the problem 1.3.2 Analyzing requirements and constraints	1a. Understand different types of problems 1b. Apply systematic steps to solve real-world problems 1c. Develop analytical and creative thinking abilities Activities: 1d. Case studies based on engineering and social problems			CO1

	1.3.3 Planning a solution 1.3.4 Executing the plan 1.3.5 Reviewing and improving the solution 1.4 Steps in problem-solving: understanding the problem, planning, execution, and review 1.5 Role of critical thinking and creativity in effective problem-solving	1e. Group discussion on real-life problem-solving experiences			
2	UNIT 2: Problem-Solving Techniques 2.1 Brainstorming techniques and idea generation 2.2 Lateral thinking: concept and applications 2.3 Decision-making techniques: 2.3.1 Decision trees 2.3.2 Flowcharts for logical representation 2.4 Root Cause Analysis (RCA): 2.4.1 5 Whys technique 2.4.2 Fishbone (Ishikawa) diagram 2.5 SWOT analysis for problem evaluation and decision-making 2.6 Application of problem-solving tools in software development and IoT systems	2a. Use structured tools for effective problem analysis 2b. Apply decision-making techniques to engineering problems Activities: 2c. Hands-on practice with flowcharts and mind maps 2d. Role-play exercises on decision-making scenarios			CO2
	UNIT 3: Logical Reasoning & Analytical Thinking 3.1 Concept of logical reasoning in	3a. Strengthen logical and reasoning abilities 3b. Analyze complex situations			CO3

3	problem-solving 3.2 Deductive reasoning: general to specific approach 3.3 Inductive reasoning: specific to general approach 3.4 Identification of patterns and sequences 3.5 Analytical thinking techniques for breaking down problems 3.6 Logical puzzles, brain teasers, and games 3.7 Case studies emphasizing analytical thinking in engineering solutions	systematically Activities: 3c. Solving logical reasoning questions and puzzles 3d. Discussion on real-life analytical problem scenarios			
4	UNIT 4: Introduction to Behavioral Ethics 4.1 Meaning and scope of ethics Importance of ethics in personal and professional life 4.2 Ethical values and moral principles 4.3 Ethical decision-making process 4.4 Understanding moral dilemmas 4.5 Ethical reasoning and judgement 4.5.1 Introduction to ethical theories: 4.5.2 Utilitarianism, Deontology, Virtue Ethics 4.6 Relevance of ethics in technology, data handling, and IoT applications	4a. Understand ethical principles and theories 4b. Analyze ethical issues and moral conflicts Activities: 4c. Case studies on ethical dilemmas 4d. Group debates on ethical and unethical actions			CO4
	UNIT 5: Professional Ethics and Workplace Behavior	5a. Demonstrate ethical behavior in			CO5

5	5.1 Ethics in professional and organizational settings 5.2 Code of ethics for engineers 5.3 Professional responsibilities and accountability 5.4 Integrity, honesty, and transparency at the workplace 5.5 Ethical leadership and teamwork 5.5.1 Ethical challenges in IT, Computer Engineering, and IoT sectors 5.6 Concept and importance of Corporate Social Responsibility (CSR) 5.6.1 Social and environmental responsibility of engineers	professional life 5b. Understand responsibilities towards society and organization Activities: 5c. Role-play on ethical workplace situations 5d. Group discussions on professional ethics and CSR			
6	UNIT 6: Practical Applications & Capstone Project 6.1 Application of problem-solving techniques to real-life and engineering problems 6.2 Identification and analysis of ethical issues in business, technology, or society 6.3 Ethical evaluation of case studies related to data privacy, automation, AI, or IoT 6.4 Team-based problem identification and solution design 6.5 Documentation and presentation skills 6.6 Peer evaluation and feedback	6a. Apply analytical and ethical concepts practically 6b. Develop teamwork, communication, and presentation skills Activities: 6c. Team project on a real-world ethical or problem-solving issue 6d. Case study presentations and discussions			CO6

D) CO-PO Matrix –

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

Name & Signature:	
(Course Experts)	
Name & Signature:	Name & Signature:
(Programme Head)	(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IOT
Course Name	Cloud Computing
Course code	R23CI3602
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	
C L	T L	L L					FA TH	SA - T H	Total		FA-PR		SA-PR		SLA			
									Ma x	M ax	M ax	M in	Ma x	Mi n	Ma x	Mi n		Ma x
4	-	2	-	6	2	3	30	70	10	40	25	10	25#	10	-	-	150	

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.

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

A) RATIONALE

Since it allows for the on-demand provisioning of software, data, and several other crucial resources across a network, cloud computing has emerged as a crucial computing paradigm. This course addresses number of fundamental topics.

Aspects of cloud computing, including cloud kinds, cloud security, cloud storage, cloud management, and monitoring. Through the creation and upkeep of cloud-based services, students will be able to apply virtualization and security to cloud services.

B) COURSE OUTCOMES (COs)

The students will be able to

1. Describe the fundamental ideas behind cloud computing.
2. Implement Virtualization in cloud Computing.
3. Illustrate Data Management in cloud.
4. Describe Security in Cloud Computing.
5. Describe Cloud on different platform.
6. Future Trends and Cloud Applications.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	Introduction to Cloud Computing 1.1 Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing. 1.2 Cloud Deployment Model: Public cloud, Private cloud, Community cloud, hybrid cloud 1.3 Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing. 1.4 Cloud Service Models: SaaS, PaaS, IaaS. 1.5 Architecture of Cloud Computing.	1a. Explain the specified Characteristics of Cloud Computing. 1b. Explain given cloud Deployment Models. 1c. Explain the given service offered by identified Cloud Service Model 1d. Explain the given component of Cloud Computing.	7	15	CO1
2	Virtualization in Cloud Computing 2.1 Introduction: Definition of Virtualization, Characteristics of Virtualization 2.2 Types of Virtualization: Server, Network, Storage, Desktop, Application, Management. 2.3 How does virtualization work? 2.4 Definition and Life Cycle of Virtual Machine (VM), VM Migration: Concept and Techniques, VM Consolidation: Concepts, VM Management: Concepts	2a. Explain Characteristics of Virtualization. 2b. Compare characteristics of Virtualization types. 2c. Explain working of Virtualization. 2d. Differentiate Virtual Machine Migration, Consolidation and Management.	6	10	CO2

	2.5 VMware: Full Virtualization Reference Model Virtualization.	2e. Explain VMware Virtualization Model			
3	Data Storage in Cloud Computing 3.1 Cloud Storage: Introduction to cloud storage, Cloud Types of Cloud Storage. 3.2 Cloud Storage System Architecture 3.3 Data Management in Cloud Storage, Cloud Provisioning 3.4 Service Level Agreement (SLA) 3.4.1 SLA management: 5 Phases of SLA management like Feasibility, On-Boarding, Pre-production, Production and Termination 3.4.2 Life cycle of SLA: 5 Phases like Contract Definition, Publishing and Discovery, Negotiation, Operationalization and Decommissioning 3.5 Cloud Service life cycle phases: Service planning, service creation, service operation and service termination	3a. Describe Enterprise Data Storage. 3b. Explain types of Cloud Storage. 3c. Describe Data Management in Cloud Storage. 3d..Describe Service Level Agreement (SLA), Life cycle of SLA and Life cycle of SLA 3e. Describe the Cloud Service life cycle phases.	8	10	CO3
4	Security in Cloud Computing 4.1 Risks in Cloud Computing: Risk Management, Types of Risks in Cloud Computing. 4.2 Data Security in Cloud: Security Issues, Challenges, Advantages, Disadvantages. 4.3 Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements. 4.4 Content level security: Pros and Cons, Features of Security-As-A-Cloud Service	4a. Explain Risk in Cloud Computing. 4b. Explain Data Security in Cloud. 4c. Explain Cloud Security Services. 4d. Explain the features of Security-As-A Cloud Service.	7	10	CO4

5	Cloud Platforms 5.1 Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB). 5.2 Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure Platform Appliance	5a. Explain Amazon Web Services. 5b. Explain Microsoft Cloud Services	6	10	CO5
6	Future Trends and Application in Cloud 6.1 Future Trends in cloud computing. 6.2 Mobile Cloud, Architecture of Mobile Cloud Computing, Applications of Mobile Cloud 6.3 Innovative Applications with the Internet of Things (Ex: Health care: ECG Analysis in Cloud and it's access, CRM and ERP: Business and Consumer Application). 6.4 Migrating to the Cloud: which application do you need? Sending your existing data to cloud, Cost Saving.	6a. Describe Future Trends in cloud computing. 6b. Explain Mobile Cloud. 6c. Describe Cloud Computing Applications. 6d. Explain Migrating to Cloud	6	15	CO6

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 any cloud architecture and it's service provider	LLO 1.1 Understand the structure of a cloud architecture and identify the services offered by a selected cloud provider.	2	CO1
2.	Install virtual box with Linux OS on top of window.	LLO 2.1 Install VirtualBox and successfully set up a Linux operating system on Windows.	2	CO2
3.	Install VMware with Ubuntu operating system	LLO 2.1 Install VMware and configure an Ubuntu operating system within it.	2	CO2
4.	Install C compiler in virtual machine created using VMware and execute Simple Programs	LLO 2.1 Install a C compiler inside a VMware virtual machine and execute simple C program	2	CO2
5.	To perform and understand file operations such as uploading, accessing, updating, sharing, and deleting files using Google Drive cloud storage.	LLO 3.1 Perform basic cloud file operations such as uploading, accessing, updating, sharing, and deleting files using Google Drive	2	CO3
6.	To study and implement various security settings and file sharing permissions in Google Drive for ensuring access control, data privacy, and secure collaboration in a cloud environment.	LLO 3.1 Implement security settings and file-sharing permissions in Google Drive to ensure data privacy and controlled access.	2	CO3
7.	To create and analyze a sample Service Level Agreement (SLA) focusing on its key components, performance parameters, and SLA lifecycle.	LLO 3.1 Understand and analyze the key components, performance parameters, and lifecycle of a Service Level Agreement (SLA)	2	CO3
8.	To study and implement the different phases of the Cloud Service Life Cycle using AWS (Amazon Web Services).	LLO 3.1 Understand and implement the different phases of the Cloud Service Life Cycle using AWS.	2	CO3
9.	Study of Cloud Security and it's types	LLO 4.1 Understand cloud security concepts and differentiate between its various types.	2	CO4
10.	Study of Microsoft Cloud Service.	LLO 5.1 Explore and explain the core components and functionalities of Microsoft Cloud Services.	2	CO5

11.	Case Study of Amazon EC2 and learn about Amazon EC2 with services.	LLO 5.1 Analyze Amazon EC2 and its associated services through a detailed case study.	2	CO5
12.	Case study on ECG Analysis, CRM and ERP in Cloud Computing	LLO 6.1 Examine cloud-based applications through case studies on ECG Analysis, CRM, and ERP.	2	CO6
13.	To understand Mobile Cloud Computing (MCC) and perform hands-on tasks of uploading, syncing, and accessing files across devices using a cloud-based mobile application.	LLO 6.1 Perform hands-on tasks in Mobile Cloud Computing by uploading, syncing, and accessing files across devices using a cloud-based mobile app.	2	CO6

D) 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	“VMWare and Virtual Box (Both)	CO2

E) 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 Cloud Computing	7	6	10	-	15
2.	Virtualization in Cloud Computing	6	4	8	-	10
3.	Data Storage in Cloud Computing	8	4	8	-	10
4.	Security in Cloud Computing	7	4	8	3	10
5.	Cloud Platforms	6	2	6	4	10
6.	Future Trends and Application in Cloud	6	4	8	4	15
		40	24	48	08	70

ASSESSMENT 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**

- 1) End semester examination, Lab performance, Viva voce

F) LEARNING RESOURCES –

- **BOOKS**

Sr.No .	Author	Title	Publisher with ISBN Number
1	Cloud Computing: A Practical Approach for Learning and Implementation	A. Srinivasan, J. Suresh.	Pearson, ISBN: 978-81-317-7651-3
2	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi	Mastering Cloud Computing	McGraw Hill Education, ISBN-13:978-1-25-902995-0
3	The Enterprise Cloud	James Bond	Media, Inc. ISBN: 9781491907627
4	Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more	Dr. Kris Jamsa	Wiley Publications, ISBN: 978-0-470-97389-9
5	Cloud Computing: A Practical Approach	Anthony T. Velte Toby J. Velte, Robert Elsenpeter	2010, The McGraw-Hill.
6	Cloud Security and Privacy	Tim Mather, Subra K, ShahidL	Oreilly, ISBN-13 978-81-8404-815-5

• WEBSITES LINKS

Sr.No.	Link / Portal
1	https://onlinecourses.nptel.ac.in/noc21_cs14/preview?
2	https://onlinecourses.nptel.ac.in/noc21_cs15/preview?
3	https://www.digimat.in/nptel/courses/video/106105167/L01.html
4	https://www.digimat.in/nptel/courses/video/106105167/L03.html
5	https://www.digimat.in/nptel/courses/video/106105167/L20.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

G) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

Name & Signature:

(Programme Head)

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IoT
Course Name	Data Analytics
Course code	R23CI3603
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	
C L	T L	L L					FA TH	SA - T H	Total		FA-PR		SA-PR		SLA			
									Ma x	M Ax	M ax	M in	Ma x	Mi n	Ma x	Mi n		Ma x
4	-	2	-	6	2	3	30	70	10	40	25	10	25#	10	-	-	150	

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.

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

A) RATIONALE

Data Analytics has become a core component in modern decision-making. Organizations across domains—business, healthcare, finance, governance, transportation, and morerely on data-driven insights to improve efficiency and competitiveness.

This course aims to build foundational knowledge of data collection, preprocessing, statistical analysis, visualization, and introductory machine learning. The curriculum bridges theoretical understanding with practical applications to enable informed decision-making using data

B) COURSE OUTCOMES (COs)

The students will be able to

- 1: Explain fundamental concepts, importance, and applications of data analytics.
- 2: Demonstrate data collection, cleaning, transformation, and integration techniques.
- 3: Apply statistical techniques and perform Exploratory Data Analysis (EDA).
- 4: Create effective data visualizations and dashboards using analytical tools.
- 5: Implement basic machine learning algorithms and evaluate their performance.
- 6: Describe applications, modern trends, and industry use cases of analytics.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	Introduction to Data Analytics 1.1 Importance of Data Analytics, Characteristics, Advantages & Limitations 1.2 Types of Analytics: Descriptive, Diagnostic, Predictive, Prescriptive 1.3 Data Ecosystem: Data Sources, Data Types, Databases, Data Warehouse, Data Lake 1.4 Applications of Data Analytics in various domains 1.5 Role and Responsibilities of a Data Analyst	1a. Describe characteristics and importance of Data Analytics. 1b. Explain types of analytics with examples. 1c. Identify components of the data ecosystem. 1d. Describe applications of Data Analytics in industry.	7	15	CO1
2	Data Collection and Preprocessing 2.1 Data Collection: Methods & Data Sources 2.2 Types of Data: Numerical, Categorical, Time-series, Text 2.3 Data Quality Issues: Missing data, Outliers, Noise 2.4 Data Cleaning Techniques: Imputation, Outlier Treatment 2.5 Data Transformation: Normalization, Standardization, Encoding 2.6 Data Integration: Merging, Joining, Combining datasets	2a. Explain methods of data collection and types of data. 2b. Identify and classify data quality issues. 2c. Perform preprocessing techniques on datasets. 2d. Explain data transformation and integration.	8	10	CO2

3	Statistical Analysis and Exploratory Data Analysis 3.1 Descriptive Statistics: Mean, Median, Mode, SD, Variance 3.2 Probability Basics & Distributions 3.3 Correlation & Regression 3.4 Hypothesis Testing: t-test, chi-square 3.5 Exploratory Data Analysis (EDA): Summary Stats 3.6 EDA Visuals: Boxplot, Histogram, Scatter Plot	3a. Describe descriptive statistical measures. 3b. Apply probability and correlation concepts. 3c. Perform regression and hypothesis testing. 3d. Conduct EDA on a dataset.	7	10	CO3
4	Data Visualization 4.1 Importance and Principles of Visualization 4.2 Tools: Power BI, Tableau, Excel, Matplotlib 4.3 Chart Types: Bar, Line, Pie, Histogram, Heatmap 4.4 Dashboard Creation: Filters, Slicers, KPIs 4.5 Data Storytelling Basics	4a. Explain the importance of visualization. 4b. Use visualization tools to create charts. 4c. Develop dashboards for analytical presentation. 4d. Demonstrate storytelling techniques using visuals	6	10	CO4
5	Machine Learning Basic 5.1 Introduction to ML: Supervised & Unsupervised Learning 5.2 Algorithms: Linear Regression, Logistic Regression, KNN 5.3 Unsupervised Algorithms: K-Means, Hierarchical 5.4 Model Evaluation: Accuracy, Precision, Recall, F1, MSE 5.5 Overfitting vs Underfitting	5a. Explain basic concepts of machine learning. 5b. Apply simple supervised ML algorithms. 5c. Apply unsupervised ML algorithms. 5d. Evaluate performance of ML models.	6	10	CO5
	Applications and New Trends 6.1 Big Data Analytics: Overview & V's 6.2 Edge Computing: Fundamentals & Applications 6.3 Quantum Computing: Introduction & Potential 6.4 AI Ethics: Principles and Frameworks 6.5 Blockchain in Data: Security and Transparency	6a. Describe Big Data and cloud analytics concepts. 6b. Explain IoT-based analytics and its challenges. 6c. Discuss the role of AI in data science. 6d. Explore the applications of quantum computing in data analysis. 6e. Analyze the ethical implications of AI in data science. 6f. Investigate the use of blockchain in ensuring data integrity and security.			

6	6.2 Cloud-Based Analytics (AWS, Azure, GCP)	real-time analytics.	6	15	CO6
	6.3 IoT & Real-Time Analytics	6c. Analyze applications of analytics across industries.			
	6.4 Industry Use Cases: Healthcare, Retail, Banking, Manufacturing				
	6.5 Modern Trends: AI, AutoML, Ethical Analytics.	6d. Explore current and emerging trends.			

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.	Setting Up Python/Colab and Exploring the Basics of Data Analytics Tools	LLO 1.1 Install and configure Python/Colab for performing analytical tasks. Understand and use basic operations and essential libraries for data analytics.	2	CO1
2.	Identifying and Understanding Data Types, Data Sources, and Data Storage Systems	LLO 1.1 Identify various data types, formats, and sources used in analytics. Explain the purpose of databases, data warehouses, and data lakes within a data ecosystem	2	CO1
3.	Collecting Data from CSV, Excel, SQL, and APIs for Analytical Use	LLO 2.1 Import datasets from multiple sources such as CSV, Excel, SQL, and APIs. Compare different data acquisition methods and select suitable options for analysis.	2	CO2
4.	Performing Data Cleaning by Handling Missing Values and Detecting Outliers	LLO 2.1 Detect missing values and apply imputation techniques to clean the dataset. Identify outliers through statistical rules and visual inspection.	2	CO2

5.	Applying Descriptive Statistical Measures for Dataset Understanding	LLO 3.1 Calculate descriptive measures including mean, median, variance, and standard deviation.	2	CO3
6.	Conducting Exploratory Data Analysis (EDA) Using Visual and Statistical Techniques	LLO 3.1 Generate visualizations such as histograms, scatterplots, and boxplots.	2	CO3
7.	Creating Essential Data Visualizations Using Matplotlib and Seaborn	LLO 4.1 Create appropriate charts to represent data effectively. Apply visualization principles to enhance interpretation and readability.	2	CO4
8.	Designing Interactive Dashboards Using Power BI or Tableau	LLO 4.1 Build interactive dashboards incorporating KPIs, filters, and slicers. Present insights through visually structured and interactive data storytelling.	2	CO4
9.	Implementing Basic Supervised Learning Models – Linear and Logistic Regression	LLO 5.1 Train and test supervised ML models using regression algorithms. Evaluate model outcomes using accuracy, error metrics, and performance indicators.	2	CO5
10.	Applying Unsupervised Learning Techniques – K-Means and Hierarchical Clustering	LLO 5.1 Perform clustering techniques and visualize resulting groups. Interpret cluster patterns and explain behavior of unsupervised algorithms.	2	CO5
11.	Exploring Cloud-Based Analytics Platforms (AWS/Azure/GCP) for Big Data Processing	LLO 6.1 Access and navigate cloud-based analytics platforms for dataset handling. Understand workflows for storing, querying, and analyzing data on the cloud.	2	CO6
12.	Simulating and Analyzing Real-Time Data Streams for IoT Applications	LLO 6.1 Simulate real-time or streaming data using sample inputs or sensors. Process and visualize streaming data to understand real-time analytics operations.	2	CO6

D) 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 / Colab	ALL

E) 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 Analytics	7	6	8	1	15
2.	Data Collection and Preprocessing	8	4	5	1	10
3.	Statistical Analysis & EDA	7	3	5	2	10
4.	Data Visualization	6	2	5	3	10
5.	Machine Learning Basics	6	2	4	4	10
6.	Applications & New Trends	6	4	4	7	15
		40	21	31	18	70

ASSESSMENT 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**
 - 1) End semester examination, Lab performance, Viva voce

F) LEARNING RESOURCES –

• BOOKS

Sr.No	Title	Author	Publisher with ISBN Number
1	Data Analytics Made Accessible	Anil Maheshwari	Amazon Digital Services ISBN: 978-1503219128
2	The Visualization Handbook	Charles D. Hansen & Christopher R. Johnson	Elsevier (Academic Press) ISBN: 978-0-12-387582-2
3	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber & Jian Pei	Elsevier / Morgan Kaufmann ISBN: 978-1-292-06584-2
4	Applied Statistics and Probability for Engineers	Douglas C. Montgomery & George C. Runger	John Wiley & Sons ISBN: 978-0470865400
5	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and I Python	Wes McKinney	O'Reilly Media ISBN: 978-1491957660
6	Machine Learning – A Probabilistic Perspective	Kevin P. Murphy	MIT Press ISBN: 978-0262018029

• WEBSITES LINKS

Sr.No.	Link / Portal
1	https://elearn.nptel.ac.in/shop/nptel/data-analytics-with-python/ elearn.nptel.ac.in
2	https://elearn.nptel.ac.in/shop/nptel/big-data-computing/ elearn.nptel.ac.in
3	https://elearn.nptel.ac.in/shop/nptel/data-analytics-with-python/ elearn.nptel.ac.in
4	https://archive.nptel.ac.in/courses/106/107/106107220/ NPTEL
5	https://elearn.nptel.ac.in/shop/nptel/data-science-for-engineers/ elearn.nptel.ac.in

Note:

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

G) CO-PO Matrix –

[illegible]

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature: _____

(CDC In-charge)

CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE – 411 001

Diploma Programme	Computer Engineering And IOT
Course Name	Cyber Security
Course code	R23CI3601
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	
CL	TL	LL					FA TH	SA - TH	Total		FA-PR		SA-PR		SLA			
									Max	Min	Max	Min	Max	Min	Max	Min		
4	-	2	-	6	2	3	30	70	10	40	25	10	25#	10	-	-	150	

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.

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

A) RATIONALE

Cyber threats, data breaches, and digital attacks are rising globally. Institutions need professionals who understand network security, cryptography, ethical hacking, secure system design and incident response. This course aims to provide students with foundational and applied knowledge in cybersecurity. The syllabus is designed to combine theoretical understanding (security principles, cryptography, network security, legal/ethical aspects) with hands-on practical skills (vulnerability assessment, penetration testing, secure configuration, forensic basics), making students industry-ready.

B) COURSE OUTCOMES (COs)

The students will be able to

- 1: Describe basic concepts of cyber security, cyber laws, threats, and attacks.
- 2: Analyze malware, vulnerabilities, and security breaches.
- 3: Apply authentication, encryption, and access control techniques.
- 4: Demonstrate secure browsing practices, network security, and device protection
- 5: Perform basic digital forensics, incident response, and implement security tools.
- 6: Follow best practices for personal, organizational, and mobile security.

C) COURSE CONTENT

Unit. No	Topics and Sub-topics	Unit Outcomes (UOs)/ Learning Outcomes (LOs)	CL Hrs./ Week	FAT H MAX.	CO Mapped
1	Introduction to Cyber Security 1.1 Introduction to Cyber Security Need and Importance of Cyber Security 1.2 CIA Triad: Confidentiality, Integrity, Availability 1.3 Cyber Threats and Vulnerabilities 1.4 Types of Cyber Attacks: a. Malware (Virus, Worm, Trojan, Ransomware) b. Phishing and Spoofing c. Denial of Service (DoS & DDoS) d. Man-in-the-Middle Attack 1.5 Cyber Security Challenges and Trends	1a. Define cyber security and explain its importance. 1b. Explain CIA triad in information security. 1c. Identify different types of cyber threats and attacks. 1d. Analyze vulnerabilities and risks in computer systems.	7	15	CO1
2	Cryptography and Data Security 2.1 Introduction to Cryptography 2.2 Goals of Cryptography 2.3 Symmetric Key Cryptography: AES, DES (concept) 2.4 Asymmetric Key Cryptography: RSA (concept) 2.4.1 Hash Functions and Message Digest 2.4.2 Digital Signatures and Certificate 2.5 Authentication and Key Management Techniques	2a. Explain basic concepts of cryptography. 2b. Differentiate between symmetric and asymmetric encryption. 2c. Apply hashing and digital signature concepts for data integrity. 2d. Explain authentication and key management techniques.	8	10	CO2
	Network Security 3.1 Network Security Fundamentals 3.2 Types of Network Attacks 3.3 Firewalls: Types and Working 3.4 Intrusion Detection System (IDS) and Intrusion Prevention System (IPS) 3.5 Secure Network Protocols: SSL, TLS, HTTPS	3a. Explain the need for network security. 3b. Identify network-based attacks. 3c. Describe the working of firewall, IDS, and IPS. 3d. Implement secure communication using	7	10	CO3

3	3.6 Virtual Private Network (VPN) 3.7 Wireless Network Security Issues	network security protocols.			
4	Operating System & Application Security 4.1 Operating System Security Concepts 4.2 User Authentication and Authorization 4.3 Access Control Models 4.4 Malware Analysis and Protection Techniques 4.5 Application Security Basics 4.6 Secure Coding Practices 4.7 Software Vulnerabilities and Threats	4a. Explain operating system security mechanisms. 4b. Implement user authentication and access control. 4c. Identify malware and prevention techniques. 4d. Apply secure coding practices to protect applications.	6	10	CO4
5	Cyber Laws, Ethics & Digital Forensics 5.1 Introduction to Cyber Laws 5.2 Information Technology Act, 2000 (India) 5.3 Types of Cyber Crimes 5.4 Cyber Ethics and Professional Responsibility 5.5 Digital Forensics: Introduction and Need 5.6 Digital Evidence and Forensic Investigation Process 5.7 Cyber Security Standards and Policies	5a. Explain cyber laws applicable in India. 5b. Identify various cyber crimes and ethical issues. 5c. Describe digital forensic investigation processes. 5d. Explain cyber security standards and policies.	6	10	CO5
6	Cyber Security Tools & Emerging Trends 6.1 Cyber Security Tools: Antivirus, Firewall Tools 6.2 Vulnerability Assessment and Penetration Testing (Introduction) 6.3 Social Engineering Attacks and Prevention 6.3.1 Cloud Security Basics 6.3.2 IoT Security Challenges 6.3.3 Artificial Intelligence in Cyber Security 6.4 Future Trends in Cyber Security	6a. Use basic cyber security tools for protection. 6b. Perform basic vulnerability assessment. 6c. Identify social engineering attacks and prevention techniques. 6d. Analyze emerging trends and future challenges in cyber security.	6	15	CO6

D) 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 basic cyber security concepts, need of cyber security, CIA triad, threats and vulnerabilities	LLO 1.1 Identify basic cyber security concepts and principles. Explain confidentiality, integrity, and availability in information security.	2	CO1
2.	Analyze real-world cyber attack incidents such as ransomware, phishing, or DDoS.	LLO 1.1Analyze different cyber attacks and their impacts. Identify vulnerabilities exploited in cyberattacks.	2	CO1
3.	Implement data encryption and decryption using symmetric encryption tools or software.	LLO 2.1 Apply symmetric encryption to secure data. Verify confidentiality of encrypted information.	2	CO2
4.	Generate hash values and digital signatures for files to ensure integrity and authenticity.	LLO 2.1 Use hashing techniques to ensure data integrity. Verify authenticity using digital signatures.	2	CO2
5.	Study and configure firewall rules to allow or block network traffic.	LLO 3.1 Configure firewall rules for network security. Analyze the effect of firewall policies on traffic flow.	2	CO3
6.	Study IDS/IPS tools (Snort or equivalent) and detect suspicious activities.	LLO 3.1 Identify network intrusions using IDS tools. Analyze intrusion alerts and logs.	2	CO3
7.	Configure user accounts, permissions, and access control policies in the operating system.	LLO 4.1 Implement authentication and authorization mechanisms. Apply access control policies to protect resources.	2	CO4
8.	Detect and remove malware using antivirus and security tools.	LLO4.1 Identify different types of malware. Use security tools to protect systems from malware.	2	CO4
9.	Study IT Act 2000, cyber crimes, and ethical issues with real case examples.	LLO 5.1Interpret cyber laws applicable to cyber crimes Explain ethical responsibilities in cyber security.	2	CO5
10.	Simulate digital evidence collection, preservation, and analysis.	LLO 5.1Demonstrate basic digital forensic procedures. Maintain integrity of digital	2	CO5

		evidence.		
11.	Perform vulnerability scanning using open-source security tools.	LLO 6.1 Identify vulnerabilities in systems and networks. Analyze vulnerability scan reports.	2	CO6
12.	Demonstrate social engineering attacks and preventive measures.	LLO 6.1 Identify social engineering techniques. Apply preventive measures against social engineering attacks.	2	CO6

E) 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	Cryptool/ OpenSSL	CO2

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.	Introduction to Cyber Security	7	6	4	5	15
2.	Cryptography and Data Security	8	4	3	3	10
3.	Network Security	7	3	4	3	10
4.	Operating System & Application Security	6	3	3	4	10
5.	Cyber Laws, Ethics & Digital Forensics	6	4	3	3	10
6.	Cyber Security Tools & Emerging Trends	6	5	4	6	15
	Total	40	25	21	24	70

ASSESSMENT 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**

- 1) End semester examination, Lab performance, Viva voce

G) LEARNING RESOURCES –

- **BOOKS**

Sr.No	Title	Author	Publisher with ISBN Number
1	Cyber Security	Sanjay Kumar Rai, Pankaj Mishra, Shivaji Kumar Yadav, Manik Chandra Pandey	Book Bazooka Publication ISBN: 978-9386895646
2	Cyber Security: The Complete Guide to Cyber Threats and Protection (2nd Edition)	David Sutton	BCS, The Chartered Institute for IT ISBN: 978-1780175959
3	Cryptography and Network Security: Principles and Practice	William Stallings	Pearson Education ISBN: 978-0-13-600632-9
4	Computer and Information Security Handbook (Third Edition)	John R. Vacca	Morgan Kaufmann ISBN: 978-0128038437
5	Information Security: The Complete Reference	Mark Rhodes-Ousley	McGraw-Hill Education ISBN: 978-0071784351
6	The Code Book: The Science of Secrecy from Ancient Egypt to Quantum Cryptography	Simon Singh	Fourth Estate / Doubleday ISBN: 978-1-85702-879-9

- **WEBSITES LINKS**

Sr.No.	Link / Portal
1	https://elearn.nptel.ac.in/shop/nptel/cybersecurity-and-its-role-in-healthcare-today/
2	https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/open-source-tools-for-cyber-security/
3	https://onlinecourses-archive.nptel.ac.in/noc19_cs29/course
4	https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/open-source-tools-for-cyber-security/
5	https://elearn.nptel.ac.in/shop/nptel/nciipc-and-nptel/

Note:

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

H) CO-PO Matrix –

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

Name & Signature:

(Course Experts)

Name & Signature:

(Programme Head)

Name & Signature:

(CDC In-charge)