K.K. Wagh Institute of Engineering Education and Research, Nashik

Curriculum

B.Tech

Computer Engineering

2023 Pattern

w.e.f.: AY 2023-2024

Summary of Credits and Total Marks for Under Graduate (UG) Programme:

Class	Semester	Total Credits	Total Marks
FY BTECH	**I**	**20**	**700**
	II	**22**	**800**
SY BTECH	**III**	**22**	**750**
	IV	**22**	**750**
TY BTECH	**V**	**22**	**750**
	VI	**22**	**750**
FINAL BTECH	**VII**	**22**	**750**
	VIII	**20**	**750**
Total		**172**	**6000**

Description of various Courses:

Type of Course	Description	Type of Course	Description
ESC	Engineering Science Courses	PCC	Program Core Course
BSC	Basic Science Courses	PEC	Program Elective Courses
CC	Co-curricular courses (Liberal Learning courses)	OE	Open Elective Courses of other than particular program
CEP/FP	Common Engineering Project(CEP)/Field Project(FP)	VEC	Value Education Courses
OJT	On Job Training	ASM	Additional Specialized/MOOCs
MDM	Multidisciplinary Minor	HSSM	Humanities, Social Science and Management
AEC	Ability Enhancement Course	VSEC	Vocational and Skill Enhancement Course
PROJ	Project	RM	Research Methodology
IKS	Indian Knowledge System		

F.Y. B. Tech Computer Engineering wef AY 2023-24															
SEM-I															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT**	**TW**	**TOTAL**	**TH**	**TU**	**PR***	**TOTAL**
2300101A	BSC	Linear Algebra and Differential Calculus	3	1	0	20	60	20	25	0	125	3	1	0	4
2300104A	BSC	Applied Chemistry	3	0	2	20	60	20	0	50	150	3	0	1	4
2300105A	ESC	Fundamentals of Electrical Engineering	3	0	2	20	60	20	0	50	150	3	0	1	4
2300108A	ESC	Programming in C	1	0	2	20	30	0	0	50	100	1	0	1	2
2300112A	AEC	Communication Skills	1	0	2	0	0	25	0	50	75	1	0	1	2
2300111A	VSEC	Workshop Practice	1	0	2	0	0	25	0	25	50	1	0	1	2
2300115A	CC	Sports, Yoga and Art	0	2	0	0	0	0	50	0	50	0	2	0	2
Total			**12**	**3**	**10**	**80**	**210**	**110**	**75**	**225**	**700**	**12**	**3**	**5**	**20**

Note: Credits are as per the Teaching Scheme.
***Credits for 'PR' head are linked with 'TW' marks**

F.Y. B. Tech Computer Engineering wef AY 2023-24														
SEM-II														
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT**	**TW**	**TOTAL**	**TH**	**TU**	**PR***	**TOTAL**
2300102A	BSC	Differential Equations and Integral Calculus	3	1	0	20	60	20	25	0	125	3	1	0	4
2300103A	BSC	Applied Physics (A)	3	0	2	20	60	20	0	50	150	3	0	1	4
2300107A	ESC	Fundamentals of Electronics Engineering	3	0	2	20	60	20	0	50	150	3	0	1	4
2300110A	ESC	Engineering Drawing	1	0	2	20	30	0	0	50	100	1	0	1	2
2300118A	PCC	Computational Thinking and Problem Solving	2	0	0	20	60	20	0	0	100	2	0	0	2
2300116A	IKS	Indian Knowledge System	0	2	0	0	0	0	50	0	50	0	2	0	2
2300117A	VSEC	Python Programming	1	0	2	0	0	25	0	25	50	1	0	1	2
2300115B	CC	Engineering Exploration	0	2	0	0	0	0	75	0	75	0	2	0	2
Total			**13**	**5**	**8**	**100**	**270**	**105**	**150**	**175**	**800**	**13**	**5**	**4**	**22**

Department Specific Exit Courses (To award Certificate)															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT**	**TW**	**TOTAL**	**TH**	**TU#**	**PR***	**TOTAL**
2300119A	EXIT	Internship**	0	2	0	0	0	0	0	100	100	0	2	0	2
2300120A	EXIT 1	Web Designing using HTML & CSS	2	0	2	20	30	0	0	50	100	2	0	1	3
2300121A	EXIT 2	Web development using PHP and MYSQL	2	0	2	20	30	0	0	50	100	2	0	1	3
Total			**4**	**2**	**4**	**40**	**60**	**0**	**0**	**200**	**300**	**4**	**2**	**2**	**8**

Note: Credits are as per the Teaching Scheme.
***Credits for 'PR' head are linked with 'TW' marks**
 # Credits for 'TU' head are linked with 'TW' marks
****Internship in industry for 2-weeks**

To get certificate student should get following credits

Internship	2 credits
Exit course-1 Web Designing using HTML & CSS	3 credits
Exit course-2 Web development using PHP and MYSQL	3 credits
Total credits	**8 credits**

S.Y. B. Tech Computer Engineering wef AY 2024-25															
SEM-III															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2301201	PCC	Discrete Structures	3	-	-	20	60	20			100	3	-	-	3
2301202	PCC	Operating Systems	3	-	-	20	60	20			100	3	-	-	3
2301203	PCC	Computer Graphics	3	-	-	20	60	20			100	3	-	-	3
2301204	PCC	Operating Systems Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301205	PCC	Object Oriented Programming and Computer Graphics Lab	-	-	4				50	50	100	-	-	2	2
2301206	MDM	Digital Electronics and Logic Design	3	-	-	20	60	20	-	-	100	3	-	-	3
2301207	MDM	Digital Electronics Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301208	OE	Digital Marketing	2	-	-	-	-	50	-	-	50	2	-	-	2
2301209	VEC	Democracy, Election and Governance	-	2	-	-	-	50	-	-	50	-	2	-	2
2301210	VSEC	Design Thinking	-	1	2	-	-	-	Tut-25 TW-25	-	50	-	1	1	2
		Total	**14**	**03**	**10**	**80**	**240**	**180**	**150**	**100**	**750**	**14**	3	**5**	**22**

S.Y. B. Tech Computer Engineering wef AY 2024-25															
SEM-IV															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300211A	BSC	Probability & Statistics	3	-	-	20	60	20			100	3	-	-	3
2301212	PCC	Data Structures	3	-	-	20	60	20			100	3	-	-	3
2301213	PCC	Software Engineering	3	-	-	20	60	20			100	3	-	-	3
2301214	PCC	Java Programming Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301215	PCC	Data Structures Lab	-	-	4				50	50	100	-	-	2	2
2301216	MDM	Data Communication and Networking	3	-	-	20	60	20	-	-	100	3	-	-	3
2301217	MDM	Data Communication and Networking Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301218	OE	Customer Relationship Management	2	-	-	-	-	50	-	-	50	2	-	-	2
2301219	VSEC	Universal Human Values	-	2	-	-	-	50	-	-	050	-	2	-	2
2301220	AEC	Foreign Language	-	1	2	-	-	-	Tut-25 TW-25	-	50	-	1	1	2
Total			**14**	**03**	**10**	**80**	**240**	**180**	**150**	**100**	**750**	**14**	**3**	**5**	**22**

Department Specific Exit Courses (To award Diploma)															
Course Code	**Course Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU /TW**	**PR**	**TOTAL**
2301221	EXIT	Internship	2-weeks			Internship Report						-	2	-	2
2301222	EXIT -1	Graphic Designing https://klic.mkcl.org/designing/graphic-designing	120 hours Online Course			Online Certification						6	0	0	6
											Total	**8**			

*Internship in industry for 2-weeks

To get certificate student should get following credits

Internship	2 credits
Exit course-1	6 credits
Total credits	8 credits

T.Y. B. Tech Computer Engineering wef AY 2025-26															
SEM-V															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2301301	PCC	Data Structures and algorithms	3	-	-	20	60	20	-	-	100	3	-	-	3
2311302	PCC	Artificial Intelligence	3	-	-	20	60	20	-	-	100	3	-	-	3
2301303	PCC	Database Management Systems	3	-	-	20	60	20	-	-	100	3	-	-	3
2301304	PCC	Database Management Systems Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301305	PCC	Data Structures and algorithms Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301306	PEC	Program Elective Course I	3	-	-	20	60	20	-	-	100	3	-	-	3
2301307	PEC	Program Elective Course I Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301308	OE	Management Information System	2	-	-	-	-	50	-	-	50	2	-	-	2
2301309	MDM	Computer Organization and Architecture	3	-	-	20	60	20	-	-	100	3	-	-	3
2301310	CEP	Project Based Learning	-	1	2	-	-	-	Tut-25 TW-25	-	050	-	1	1	2
		Total	**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

T.Y. B. Tech Computer Engineering wef AY 2025-26															
SEM-VI															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2301311	PCC	Data Science and Big data	3	-	-	20	60	20	-	-	100	3	-	-	3
2301312	PCC	Theory of Computation	3	-	-	20	60	20	-	-	100	3	-	-	3
2301313	PCC	Data Science and Big data Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301314	PEC	Program Elective Course II	3	-	-	20	60	20	-	-	100	3	-	-	3
2301315	PEC	Program Elective Course III	3	-	-	20	60	20	-	-	100	3	-	-	3
2301316	PEC	Program Elective Course II + Program Elective Course III Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301317	MDM	Microcontrollers and Embedded Systems	3	-	-	20	60	20	-	-	100	3	-	-	3
2301318	OE	Project Planning and Management	2	-	-	-	-	50	-	-	50	2	-	-	2
2301319	VSEC	Full Stack	-	1	2	-	-	-	25	25	50	-	1	1	2
2301320	RM	Research Seminar	-	-	2	-	-	-	50	-	50	-	-	1	1
		Total	**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TUT /TW	PR /OR	TOTAL	TH	TU	PR	TOTAL
Program Elective Course I (Sem-V) (Student have to choose any one of the following)															
2301306A	PEC	Internet of Things	3	-	-	20	60	20	-	-	100	3	-	-	3
2301306B		Augmented Reality and Virtual Reality													
2301306C		Software Testing and Quality Assurance													
Program Elective Course I Lab (Sem-V) (Student have to choose lab based on selected Program Elective Course I)															
2301307A	PEC	Internet of Things Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301307B		Augmented Reality and Virtual Reality Lab													
2301307C		Software Testing and Quality Assurance Lab													
Program Elective Course II (Sem-VI) (Student have to choose any one of the following)															
2301314A	PEC	User Interface and User Experience	3	-	-	20	60	20	-	-	100	3	-	-	3
2301314B		Generative AI and Prompt Engineering													
2301314C		High Performance Databases													
Program Elective Course III (Sem-VI) (Student have to choose lab based on selected Program Elective Course II)															
2301315A	PEC	Cloud computing	3	-	-	20	60	20	-	-	100	3	-	-	3
2301315B		Natural Language Processing													
2301315C		High Performance Computing													
Program Elective Course II + Program Elective Course Lab III Lab (Sem-VI) (Lab based on chosen elective course II and III by students)															
2301316	PEC	Program Elective Course II + Program Elective Course Lab III Lab	-	-	2	-	-	-	25	25	50	-	-	1	1

Department Specific Exit Courses (To B. Voc Degree)

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TUT /TW	PR /OR	TOTAL	TH	TU /TW	PR	TOTAL
2301321	EXIT	Internship	2-weeks			Internship Report						-	2	-	2
2301322	EXIT1	Video Editing https://klic.mkcl.org/designing/video-editing	120 hours Online Course			Online Certification						6	-	-	6
											Total	8			

*Internship in industry for 2-weeks

To get certificate student should get following credits

Internship -2 credits

Exit course-1 - 6 credits

Total credits - 8 credits

Final year of B. Tech Computer Engineering wef AY 2026-27															
SEM-VII															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2301401	PCC	Deep Learning	3	-	-	20	60	20			100	3	-	-	3
2301402	PCC	Cyber Security	3	-	-	20	60	20			100	3	-	-	3
2301403	PCC	Deep Learning Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301404	PCC	Cyber Security Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301405	PEC	Program Elective Course IV	3	-	-	20	60	20	-	-	100	3	-	-	3
2301406	PEC	Program Elective Course V	2	-	-	20	30	-	-	-	50	2	-	-	2
2301407	RM	Research Methodology	3	-	-	20	60	20	-	-	100	3	-	-	3
2301408	HSSM - EEM	Banking, Financial Services and Insurance	2	-	-	-	-	50	-	-	50	2	-	-	2
2301409	PROJ	Project Work	-	-	8	-	-	-	100	50	150	-	-	4	4
		Total	**16**	**00**	**12**	**100**	**270**	**130**	**150**	**100**	**750**	**16**	**-**	**6**	**22**

Final year of B. Tech Computer Engineering wef AY 2026-27															
SEM-VIII															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2301411	PCC*	Software Architecture and Design Patterns	3	-	-	-	100	-			100	3	-	-	3
2301412	PEC*	Program Elective Course VI	3	-	-	-	100	-	-	-	100	3	-	-	3
2301413	HSSM-EEM*	Startup and Entrepreneurship	2	-	-	-	-	50	-	-	50	2	-	-	2
2301414	INTERNSHIP	Internship	-	-	24	-	-	-	300	200	500	-	-	12	12
Total			**08**	**00**	**24**	**-**	**200**	**50**	**300**	**200**	**750**	**08**	**-**	**12**	**20**

* Considering Internship of 6 months, these courses to be offered in online mode

Program Elective Courses

Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	INSEM	ENDSEM	CCE	TUT /TW	PR /OR	TOTAL	TH	TU	PR	TOTAL
Program Elective Course IV (Sem-VII) (Student have to choose any one of the following)															
2301405A	PEC	Computer Vision	3	-	-	20	60	20	-	-	100	3	-	-	3
2301405B		Information Retrieval													
2301405C		Business Intelligence and Analytics													
Program Elective Course V (Sem-VII) (Student have to choose any one of the following)															
2301406A	PEC	Operation Research	2	-	-	20	30	-	-	-	50	2	-	-	2
2301406B		Unix Internals													
2301406C		Compiler Design													
Program Elective Course VI (Sem-VIII) (Student have to choose any one of the following)															
2301412A	PEC	Blockchain	3	-	-	-	100	-	-	-	100	3	-	-	3
2301412B		Bioinformatics													
2301412C		Digital Forensic													

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering
Pattern 2023 Semester: III
2301201: Discrete Structures

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: - 2300101A: Linear Algebra andDifferential Calculus

Companion Courses:-

Course Objectives:
- To understand the concepts of relations and functions
- To understand the use of number theory and propositional logic
- To study concepts of graphs and trees
- To study algebraic structures

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Solve problems using number theory and propositional logic	3-Apply
CO2	Make use of relationsand functions to solve associated problems	3-Apply
CO3	Apply graph theory to represent data and solve associated problems	3-Apply
CO4	Apply the concepts of trees to generate minimum spanning tree and prefix code	3-Apply
CO5	Make use of algebraic structures to solve associatedproblems	3-Apply

COURSE CONTENTS

Unit I	**Number Theory and Propositional Logic**	**(06 hrs)**	**CO1**

Number Theory: Introduction, divisibility and modular arithmetic, prime numbers, large primes, co-prime, greatest common divisors, applications of number theory in hashing and cryptography.
Propositional Logic: Propositional equivalences, predicates and quantifiers, applications of propositional logic, mathematical induction, recursive definition.

Unit II	**Relations and Functions**	**(08 hrs)**	**CO2**

Relations: Properties, n-ary relations, represent relations, equivalence relations, partial orderings, partitions, Hasse diagram, lattices, chains and anti-chains, closures of relations, Warshall's algorithm.
Functions: Types of functions, properties, Pigeonhole principle, recurrence relations.

Unit III	**Graph Theory**	**(08hrs)**	**CO3**

Graph terminology, types of graphs, representation of graphs, graph isomorphism, planar graphs, path and circuit, Euler path and circuit, Hamilton path and circuit, single source shortest path- Dijkstra's algorithm, maximum flow labeling algorithm.

Unit IV	**Trees**	**(07hrs)**	**CO4**

Trees terminology, properties of tree, prefix codes and Huffman coding, cut sets, tree traversal, spanning trees , minimum spanning tree, Kruskal's and Prim's algorithms.

Unit V	**Algebraic Structures and Coding Theory**	**(07hrs)**	**CO5**

The structure of algebra, algebraic systems, semi groups, monoids, groups, homomorphism and normal subgroups, congruence relations, rings, integral domains and fields, coding theory.

Text Books

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, ISBN 978- 0-07-288008-3
2. C. L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, ISBN 10:0-07-066913-9
3. Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures", Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.

Reference Books

1. N. Biggs, "Discrete Mathematics", 3rd Ed, Oxford University Press, ISBN 0 –19-850717–8
2. NarsinghDeo, "Graph with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4.

Strength of CO-PO / PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	2	-
Average	3	3	2.5	2	-	-	-	-	-	-	-	2	2	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit 1, Unit-2, Unit-4, Unit 5 each of 15 marks (Total marks will be converted to 15 Marks)	15
2	Theory assignment on Unit-3 of 15 marks. (Total marks will be converted to 5 Marks)	5
	Total	**20**

K. K. Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering
Pattern 2023 Semester: III
2301202 : Operating systems

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs./week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Course: -

Companion Course:- 2301204: Operating Systems Lab

Course Objectives:

- To study and understand different system software like Assembler, Macro-processor, Linkers, and Linkers.
- To study process scheduling algorithms and multithreading techniques
- To get acquainted with the concepts of synchronization, deadlock prevention and avoidance algorithms
- To learn concepts of memory management and page replacement algorithms.
- To learn different, I/O management techniques and understand the basic concepts of Linux operating systems.

Course Outcomes: On completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1	Illustrate the concept of systems software	2- Understand
CO2	Illustrate the concept of process scheduling algorithms to solve scheduling problems	2- Understand
CO3	Explain the concepts of deadlock and illustrate the techniques to detect, prevent and avoid the deadlock	2- Understand
CO4	Demonstrate the use of page replacement algorithms for memory management	2- Understand
CO5	Explain the concept of I/O management techniques	2- Understand
CO6	Demonstrate the use of Linux commands and basic shell utilities	2- Understand

COURSE CONTENTS

Unit I	**Introduction to systems programming**	**(07 Hrs)**	**CO1**

Introduction, Components of System Software, Text editors, Loaders, Linkers, Assemblers, Macro processors, Compilers, and Debuggers.
Assemblers: Elements of Assembly Language Programming, A Simple Assembly Scheme, Pass Structure of Assemblers, Design of Two Pass Assembler, Single pass Assembler.

Unit II	**Process management**	**(08 hrs)**	**CO2**

Introduction to Operating Systems
Types of operating systems: Batch, Time-sharing, Network, Distributed and real-time.
Process: Concept, Process control block, Process state diagram, Inter-process communication
Process scheduling types: First come first serve, Shortest job first, Round robin, Priority-based scheduling
Threads: Multi-core programming, Multithreading models, Implicit threading, Threading issues

Unit III	Process coordination	(07 hrs)	CO3

Synchronization: The critical-section problem, Peterson's solution, Synchronization hardware, Mutex locks, Semaphores

Classic problems of synchronization: Producer-consumer problem, Reader/writer problem, Dining philosopher problem

Deadlock: Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance and detection, Recovery from deadlock.

Unit IV	Memory Management	(07 hrs)	CO4

Memory Partitioning: Fixed partitioning, Dynamic partitioning

Contiguous Memory allocation techniques: First fit, Best fit, Worst fit, Swapping, Structure of the page table, Segmentation, Demand paging

Page Replacement algorithms: First in first out, Optimal page replacement, Least recently used translation lookaside buffer

Unit V	I/O management and Introduction to Linux	07 hrs	CO5,CO6

I/O devices, Disk scheduling algorithms: First come first serve, Shortest seek time first algorithm, SCAN, Circular-SCAN

Bash shell scripting: Basic shell commands and scripting language

Introduction to Linux: Essential features, File systems, directories, Linux shell commands such as pwd, cd, ls, cat, rm, cp, mkdir and Linux utilities such as tr, sed, grep, egrep, awk. File access rights.

Text Books

1. D. M. Dhamdhere, Systems Programming, and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", WILEY, ISBN:978-81-265-5427-0, 9th Edition
3. William Stallings, "Operating System: Internals and Design Principles", Prentice Hall, ISBN 10: 0-13-380591-3, ISBN 13: 978-0-13-380591-8, 8th Edition

Reference Books

1. John Donovan, "System Programming", McGraw Hill, ISBN 978-0--07-460482-3
2. Tom Adelstein and Bill Lubanovic, "Linux System Administration", O'Reilly Media, ISBN 10: 0596009526, ISBN 13: 978-0596009526
3. Harvey M. Deitel, "Operating Systems", Prentice Hall, ISBN 10: 0131828274, ISBN 13: 978-0131828278

Strength of CO-PO / PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	-	-	-	-	-	-	-	-	-	2	-	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit-1, Unit-2, Unit-4, Unit-5 each of 15 marks (Total marks will be converted to 15 out of 60 Marks)	15
2	Theory assignment on Unit-3 (One Assignment on Unit-3 of 15 marks will be converted to 5 Marks)	05
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering
Pattern 2023 Semester: III
2301203: Computer Graphics

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: - 2300101A Linear Algebra and Differential Calculus

Companion Courses :-

Course Objectives:

- To acquaint the learner with the basic concepts of Computer Graphics
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with the 2D and 3D transformation techniques

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Explain basic concepts of computer graphics to generate line, circle and polygon	2-Understand
CO2	Use polygon filling and polygon clipping algorithms	3-Apply
CO3	Apply geometric transformations on 2D and 3D objects	3-Apply
CO4	Make use of color models and hidden surface removal algorithms for rendering 2D/3D objects	3-Apply
CO5	Develop graphical applications using Curves and Fractals	3-Apply

COURSE CONTENTS

Unit I	**Scan Conversion Algorithms and Display Files**	**(08 hrs)**	**CO1**

Introduction: Graphics Primitives - Pixel, Resolution, Aspect ratio, Frame buffer, Display devices, Applications of computer graphics
Scan conversion: Line drawing algorithms: Digital Differential Analyzer (DDA), Bresenham.
Circle drawing algorithms: Bresenham, Midpoint
Display Files: Structure, Algorithms and Display file interpreter. Primitive operations on display file.
Segment: Segment table, Segment creation, closing, deleting and renaming, Visibility.

Unit II	**Polygons, Windowing and Clipping**	**(07hrs)**	**CO2**

Polygons: Introduction to polygon. Inside test: Even-Odd method, Winding number method
Polygon Filling: Seed fill, Scan line fill
Windowing and clipping: Introduction to windowing, 2-D clipping: Cohen – Sutherland line Clipping algorithm, Sutherland-Hodgeman Polygon clipping algorithm, Weiler-Atherton generalized Polygon Clipping algorithm

Unit III	**2D, 3D Transformations and Projections**	**(07hrs)**	**CO3**

2-D transformations: Homogeneous Coordinates, Translation, scaling, rotation and shear, rotation about an arbitrary point

3-D transformations: Translation, scaling, rotation, rotation about an arbitrary axis
Projections: Parallel (Oblique: Cavalier, Cabinet and orthographic: isometric, diametric, trimetric) and Perspective (Vanishing Points – 1 point, 2 point and 3 point).

Unit IV	**Color Models and Hidden Surface Removal**	**(07hrs)**	**CO4**

Colour models: Properties of Light, CIE chromaticity Diagram, RGB, HSV, CMY
Hidden Surface Removal: Introduction, Back face detection and removal, Algorithms: Depth buffer (z), Depth sorts (Painter), Area subdivision (Warnock)

Unit V	**Curves and Fractals**	**(07hrs)**	**CO5**

Curves: Introduction, Interpolation and Approximation, Blending function, B-Spline curve, Bezier curve
Fractals: Introduction, Fractal generation: Koch curve, Hilbert curve, Applications.

Text Books

1. S. Harrington-Computer Graphics, "A Programming Approach", Second Edition, McGraw-Hill Publications, 1987, ISBN:0 – 07 – 100472 – 6
2. D. Rogers, "Procedural Elements for Computer Graphics", Second Edition, Tata McGraw-Hill Publication, 2001, ISBN:0 – 07 – 047371 – 4

Reference Books

1. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", Second Edition, Tata McGrawHill Publication, 2002, ISBN:0 – 07 – 048677 – 8
2. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", Second Edition, Pearson Education, 2003, ISBN:81 – 7808 – 038 – 9
3. D. Hearn, M. Baker, "Computer Graphics – C Version", Second Edition, Pearson Education, 2002, ISBN:81 – 7808 – 794 – 4

Strength of CO-PO PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	2	-	-	-	-	-	-	-	2	-
CO2	3	2	-	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	2	-
CO4	3	2	2	2	3	-	-	-	-	-	-	2	2	-
CO5	3	2	3	3	3	-	-	-	-	-	-	2	2	-
Average	**3**	**2**	**2.33**	**2.33**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit 1, Unit-2, Unit-4, Unit 5 Each of 15 marks (Total marks will be converted to 15 Marks)	15
2	Theory assignment on Unit-3 of 15 marks will be converted to 5 Marks	5
	Total	**20**

K. K. Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: III** **2301204: Operating Systems Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Term Work: 25 Marks** **Practical Exam : 25 Marks**
Prerequisite Courses:- 2300108A**:** Programming In C		
Companion Course:- 2301202: Operating Systems		

Course Objectives:

- To understand operating system services, types of operating systems and shell scripts
- To study process scheduling algorithms and multithreading techniques
- To get acquainted with the concepts of synchronization, deadlock prevention and avoidance algorithms
- To learn concepts of memory management and I/O management techniques
- To introduce Linux operating systems

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Demonstrate the use of control flow statements and basic shell commands	2- Understand
CO2	Illustrate the concept of process scheduling algorithms to solve scheduling problems	2- Understand
CO3	Compare algorithms for deadlock detection, prevention and avoidance	2- Understand
CO4	Demonstrate the use of page replacement algorithms	2- Understand
CO5	Describe Linux commands and utilities such as grep, tr, sed, awk	2- Understand

Sr. No.	**List of Laboratory Assignments/ Experiments**	**COs Mapped**
1	Write a shell script for the implementation of control flow statements.	**CO1**
2	Write a shell script to find the factorial of a given number.	**CO1**
3	Write a C program to compute and print the average waiting time, average turnaround time, and CPU burst times for the given list of processes. Display/print the Gantt chart for first come first serve, shortest job first, priority scheduling, and round-robin scheduling algorithm.	**CO2**
4	Write a C program to implement the banker algorithm.	**CO3**
5	Write a C program to implement the producer-consumer problem.	**CO3**
6	Write a C program to implement page replacement algorithms such as first in first out, least recently used, and optimal page replacement.	**CO4**
7	Installation of Linux operating system and basic configuration.	**CO5**
8	Assignment on Unix basic commands such as pwd, ls, cat, redirection, and pipes and Unix utilities like tr, sed, grep, egrep, awk.	**CO5**
9	Execute the following AWK operations on the text file:	**CO5**

	1 Print the lines that match the given pattern 2 Splitting a Line into Fields 3 To find the length of the longest line present in the file 4 Printing the lines with more than specified characters	

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation, and comments.
Use of open-source software is to be encouraged. Operating System Recommended: Linux or its derivative. Programming tools recommended: Open Source line gcc

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory concepts in brief, algorithm, flowchart, test cases, and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Term Work Assessment

Continuous assessment of laboratory work shall be based on the overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include
R1- timely completion (10),
R2- understanding of assignment (10) and
R3- presentation/clarity of journal writing (10).

Strength of CO-PO / PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	-	-	-	-	-	-	-	-	-	2	-	-

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech.Computer Engineering **Pattern 2023 Semester: III** **2301205: Object Oriented Programming and Computer Graphics Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 04 hrs/week	**02**	**Termwork: 50 Marks** **Practical Exam : 50 Marks**
Prerequisite Courses: - 2300108A: Programming in C 2300118A: Computational Thinking and Problem Solving		
Companion Courses:- 2301203: Computer Graphics		

Course Objectives:

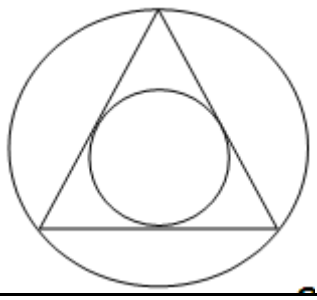
- To understand the fundamental concepts of Object Oriented programming
- To acquaint the learner with the basic concepts of Computer Graphics
- To understand and apply various methods and techniques of OOP to solve a given problem

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply Object Oriented Programming features to solve real world problems	3-Apply
CO2	Develop an application using exception handling	3-Apply
CO3	Make use of various algorithms for scan conversion,filling& clipping of polygon	3-Apply
CO4	Apply geometric transformations on 2D objects	3-Apply
CO5	Develop graphical applications using Curves, Fractals and animation techniques	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Write a C++ menu driven program to take integer number as input from user to calculate and display- i. Square ii. Cube iii. Square root iv. Factorial v. sum vi. product	CO1
2	Write a C++ program which will ask the user to enter his/her marks (out of 100). Define a function that will display grades according to the marks entered as below: Marks Grade 91-100 O 81-90 A 71-80 B 61-70 C	CO1

	51-60 D 41-50 Pass <=40 Fail	
3	Write a program by creating an 'Employee' class having the following functions and print the final salary. 1 - 'getInfo()' which takes the salary, number of hours of work per day of employee as parameters 2 - 'AddSal()' which adds Rs.10000 to the salary of the employee if it is less than Rs.50000. 3 - 'AddWork()' which adds Rs. 1000 to the salary of the employee if the number of hours of work per day is more than 6 hours.	CO1
4	Write a program to create a directory that contains the following information. (a) Name of a person (b) Address (c) Telephone Number (if available with STD code) (d) Mobile Number (if available) (e) Head of the family	CO1
5	Write a program that takes your full name as input and displays the abbreviations of the first and middle names except the last name which is displayed as it is. For example, if your name is Anil Ramchandra Salunke, then the output should be A. R. Salunke.	CO1
6	Make a class named Fruit with a data member to calculate the number of fruits in a basket. Create two other class named Apples and Mangoes to calculate the number of apples and mangoes in the basket. Print the number of fruits of each type and the total number of fruits in the basket.	CO1
7	Write a C++ program to create User defined exception to check the following conditions and throw the exception if the criterion does not met. a. User has age between 18 and 55 b. User has income between Rs. 50,000 – Rs. 1,00,000 per month c. User stays in Pune / Mumbai/ Bangalore / Chennai d. User has 4-wheeler Accept age, Income, City, Vehicle type from the user and check for the conditions mentioned above. If any of the condition not met then throw the exception.	CO1, CO2
8	Write C++ program to draw the following pattern. Use DDA line and Bresenham's circle drawing algorithm. 	CO1, CO3
9	Write C++ program to draw a concave polygon and fill it with desired color using Seed Fill /Scan LineFill algorithm.	CO1, CO3

10	Write a menu driven C++ program to implement Cohen Southerland line clipping algorithm by accepting a window and a line to be clipped against it.	CO1, CO3
11	Write C++ program to draw 2-D object and perform following basic transformations a)Scaling b) Translation c) Rotation.	CO1, CO4
12	Write a C++ program to implement bouncing ball using sine wave form.	CO1, CO5
13	Write C++ program to generate fractal patterns by using Kochcurves.	CO1, CO5
14	**Mini Project:** Design and implement game / animation clip / Graphics Editor using open source graphics library. Make use of maximum features of Object Oriented Programming.	CO1 to CO5
Additional Programming Problems		
1	We want to store the information of different vehicles. Create a class named Vehicle with two data member named mileage and price. Create its two subclasses *Car with data members to store ownership cost, warranty (by years), seating capacity and fuel type (diesel or petrol). *Bike with data members to store the number of cylinders, number of gears, cooling type(air, liquid or oil), wheel type(alloys or spokes) and fuel tank size(in inches) Make another two subclasses Audi and Ford of Car, each having a data member to store the model type. Next, make two subclasses Bajaj and TVS, each having a data member to store the make-type. Now, store and print the information of an Audi and a Ford car (i.e. model type, ownership cost, warranty, seating capacity, fuel type, mileage and price.) Do the same for a Bajaj and a TVS bike.	CO1
2	Write a program to find the number of vowels, consonants, digits and white space characters in a string.	CO1
3	Print the sum, difference and product of two complex numbers by creating a class named 'Complex' with separate functions for each operation whose real and imaginary parts are entered by the user.	CO1
4	Write C++ program to draw 2-D object and perform following basic transformations:a)XShear b) Y Shear c) Reflection about Y=X.	CO1, CO4
5	Write C++ program to draw a polygon and identify its type whether convex or concave.	CO1, CO3

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation and comments.
Use of open source software is to be encouraged.
Operating System recommended: - Linux or its derivative
Programming tools recommended: - Open Source line gcc/g++

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form

Guidelines for Termwork Assessment

Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10) (Coding standard, Indentation, Hungarian notation, input validation etc)

Strength of CO-PO/PSOMapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	-	2	-	-	-	-	-	-	3	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	3	3	3
CO3	3	3	-	3	3	-	-	-	-	-	-	3	3	3
CO4	3	-	-	-	3	-	-	-	-	-	-	-	-	3
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	3
Average	**3**	**3**	**3**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: III** **2301206: Digital Electronics and Logic Design**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: - 2300107A: Fundamentals of Electronics Engineering

Companion Course: - 2301207: Digital Electronics Laboratory

Course Objectives:

- To study logic minimization techniques
- To develop skills for design and implementation of combinational logic circuits
- To develop skills for design and implementation of sequential logic circuits

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Solve the problem of minimization using K Map and Quine Mc-Clusky method of Boolean expression	3-Apply
CO2	Build combinational circuits using AND-OR logic	3-Apply
CO3	Build combinational circuits using SSI and MSI logic	3-Apply
CO4	Explain applications of Flip Flops, registers and shift registers	2-Understand
CO5	Develop sequential logic circuits using Flip Flops and MSI logic	3-Apply

COURSE CONTENTS

Unit I	**Logic Minimization Techniques**	**(08 hrs)**	**CO1**

Signed Binary Number Representation: Signed magnitude, 1's complement, 2's complement, Binary arithmetic, Boolean expression: sum of product and product of sum form, Don't care conditions, Minimization of Boolean expression using K-map and Quine Mc-Clusky method

Unit II	**Introduction to Combinational Circuits**	**(06 hrs)**	**CO2**

Introduction to combinational circuits, **Codes &Code converter :** BCD, Excess-3, Gray code, Half-adder, Full adder, Half subtractor, Full subtractor, Universal adder/subtractor, 4 bit binary adder (IC 7483), Look ahead carry generator, BCD adder

Unit III	**Combinational Logic Design**	**(06 hrs)**	**CO3**

Multiplexers, Cascading multiplexers, Demultiplexers, Encoder, Decoder, Implementation of Boolean expression using multiplexer and demultiplexer, Comparators, Parity generator and Checker. Programmable Logic Devices: ROM, PLA, PAL

Unit IV	**Introduction to Sequential Circuits**	**(08 hrs)**	**CO4**

Difference between Combinational and Sequential Circuits, Flip-Flops: SR Flip Flop, Concept of preset & clear, Clocked-SR Flip Flop, JK Flip Flop, Master slave JK flip flop, T Flip Flop, D Flip Flop, Triggering methods: Edge triggered and level triggered, Truth tables and excitation tables, Registers, Shift registers, Bidirectional shift register, Ring counter, Twisted ring counter, Universal shift register

Unit V	Sequential Logic Design	(08 hrs)	CO5

Counters: Types – Synchronous and asynchronous counters
Asynchronous Counters: Modulus of the counter, Decade counter, Up, Down and Up/Down counters
Synchronous sequential circuit design, State diagram, State assignment, State table, State reduction, Design procedure, Sequence generator, Sequence detector (With and without overlap)

Text Books

1. R. P. Jain, Modern Digital Electronics, Fourth Edition, Tata McGraw Hill, ISBN 978-0-07-06691-16
2. Moris Mano, Digital Logic and Computer Design, Second Edition, Pearson, ISBN: 978-8177584097

Reference Books

1. John Yarbrough, Digital Logic applications and Design, Fourth Edition, Thomson Publication , ISBN:978-8131500583
2. Malvino, D.Leach Digital Principles and Applications, Sixth Edition, Tata McGraw-Hill, ISBN: 978-0070601758

Strength of CO-PO/PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	2.33	-	-	-	-	-	-	-	-	-	-	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Quiz on Unit 1, Unit 2, Unit 3 each of 15 marks (Total marks will be converted to 15 Marks)	15
2	Theory assignment on Unit 4, Unit 5 each of 10 marks (Total marks will be converted to 5 Marks)	5
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: III** **2301207: Digital Electronics Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Term Work: 25 Marks** **Practical Exam: 25 Marks**
Prerequisite Courses: - 2300107A: Fundamentals of Electronics Engineering		
Companion Course:- 2301206: Digital Electronics and Logic Design		

Course Objectives:

- To study logic minimization techniques
- To develop skills for design and implementation of combinational logic circuits
- To develop skills for design and implementation of sequential logic circuits

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Solve the problem of minimization using K Map and Quine Mc-Clusky method of Boolean expression	3-Apply
CO2	Build combinational circuits using AND-OR logic	3-Apply
CO3	Build combinational circuits using SSI and MSI logic	3-Apply
CO4	Explain applications of Flip Flops, registers and shift registers	2-Understand
CO5	Develop sequential logic circuits using Flip Flops and MSI logic	3-Apply

List of Laboratory Experiments

Sr. No.	**Laboratory Experiments**	**CO Mapped**
1	To Realize Full Adder using logic gates	CO1,CO2
2	Design and implement Code Converters-Binary to Gray	CO1,CO2
3	Design and implement of BCD Adder using 4-bit Binary Adder (IC 7483)	CO1,CO2,CO3
4	Realization of Boolean Expression using Multiplexer	CO3
5	Design and implement 2 bit comparator using logic gates	CO1, CO2
6	Design and implement Parity Generator and checker	CO1, CO2
7	Implement 2 bit Ripple Counter using JK Flip Flop	CO4, CO5
8	Design Synchronous 2 bit Up/Down Counter with mode control using JK Flip Flop	CO1, CO4, CO5
9	Design and implement Modulo-N counter using Decade Counter IC 7490	CO4,CO5
10	Design and implement Sequence generator and detector using JK Flip Flop	CO1, CO4, CO5
Additional Assignments		
1	To Realize Full Subtractor using logic gates	CO1,CO2

2	Design and implement Code Converters-BCD to Excess 3	CO1,CO2
3	Realization of Full Adder using Decoder	CO3
4	Implement 3/4 bits shift registers using D Flip Flop	CO4

Guidelines for Laboratory Conduction

1. Faculty will brief the given experiment and its procedure to students.
2. Apparatus and equipment required for the allotted experiment will be provided by the lab assistants using Standard Operating Procedure.
3. Students will perform the allotted experiment in a group (three/four students in each group) under the supervision of faculty and lab assistant.
4. After performing the experiment students will show results to the faculty.

Guidelines for Student's Lab Journal

Write-up should include title, aim, steps of circuit designing (Block Diagram, Truth Table, K Map, Expression, Realization, Conclusion)

Guidelines for Termwork Assessment

Continuous assessment of laboratory work shall be based on the overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include
R1- timely completion (10),
R2- understanding of experiment (10) and
R3- presentation/clarity of journal writing (10)

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: III** **2301208: Digital Marketing**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02 hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks**

Prerequisite Courses: - -

Companion Course :- -

Course Objectives:

- To acquaint the students with the concepts of digital marketing.
- To explain the features of social media marketing.
- To illustrate the overview of marketing on various digital platforms such as Facebook and YouTube.
- To develop a digital marketing plan that will address common marketing challenges.
- To learn about web based marketing applications such as web analytics and content management.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Explain concept of digital marketing.	2-Understand
CO2	Illustrate basics of Segmentation, Targeting and Positioning to Digital Marketing	2-Understand
CO3	Explain how social media platforms and its facets are used to achieve organizational marketing objectives.	2-Understand
CO4	Demonstrate the marketing on the social media platforms	2-Understand
CO5	Illustrate applications of web analytics and content management in marketing	2-Understand

COURSE CONTENTS

Unit I	**Introduction to Digital Marketing**	**(04 hrs)**	**CO1**

Concept and definition of digital marketing; Traditional Vs. Digital marketing; Digital marketing channels and platforms; Skills required in digital marketing ; Creating initial digital plan.

Unit II	**Segmentation, Targeting and Positioning to Digital Marketing**	**(05 hrs)**	**CO2**

Segmentation: Concept, Need & Benefits, Criteria for segmenting
Targeting Online Customers – Business, Government and Customer Markets.
Product Positioning, Sectoral perspective in digital marketing applications.

Unit III	**Social Media Marketing**	**(05 hrs)**	**CO3**

Social Media Marketing: Meaning, Purpose, types of social media websites, Blogging: Types of blogs, Blogging platforms & recommendations, Social Media Engagement, Target audience, Sharing content on social media, Do's and don'ts of social media.

Unit IV	**Facebook and YouTube Marketing**	**(05 hrs)**	**CO4**

Basics of Facebook Marketing: Profiles and Pages, Business Categories, Creating Facebook Pages; Page Info and Settings.
Basics of YouTube Marketing: Google Pages for YouTube Channel, Verify Channel, Webmaster Tool, Channel customization; Monetization with Adsense,

Unit V	**Web Analytics and Content Marketing**	**(05hrs)**	**CO5**

Understanding Web Analytics: Purpose, Goals & objectives, Web Analytic tools, Web Analytics Mistakes and Pitfalls.

Basics of Content Marketing: Introduction, Content management, Content marketing statistics, Types of Content.

Text Books

1. Damian Ryan," Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Kogan Page Publisher
2. Philip Kotler, "Marketing 4.0: Moving from Traditional to Digital", Publisher Wiley
3. Jan Zimmerman, DeborahNg,"Social Media Marketing All-In-One", For Dummies; 3rd edition (April 6, 2015)

Reference Books

1. Seema Gupta, "Digital Marketing", McGraw Hill Education
2. Punit Singh Bhatia," Fundamentals of Digital Marketing", Pearson

Strength of CO-PO PSO Mapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Average	2	-	-	-	-	-	-	-	-	-	-	2	-	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit 1, Unit 2, Unit 4 each of 20 marks (Total marks will be converted to 30 Marks)	30
2	Assignment on Unit 3 and Unit 5 each of 10 marks	20
	Total	**50**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering
Pattern 2023 Semester: III
2301209: Democracy, Election and Governance

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 02 hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks** **Total: 50 Marks**

Prerequisite Courses if any: -

Course Objectives:

- This module also aims to make the individual understand the different aspects of democracy and its implications in the overall development of the state.
- The syllabus is introduced from the point of view that all students upon entering into the college, enroll themselves as voters and encourage and enthuse other members of the society to participate not only in election process but also electoral and political process in general.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Understand and practice key principles of Democracy	2-Understand
CO2	Identify how different rights are protected in Democratic systems	2-Understand
CO3	Understand various approaches for Governance	2-Understand
CO4	Reflect on the various threats and challenges to Democracy	3-Apply

COURSE CONTENTS

Unit I	**Democracy- Foundation and Dimensions**	**(08 hrs)**	**COs Mapped - CO1, CO2, CO4**

Constitution of India, Evolution of Democracy- Different Models, Dimensions of Democracy- Social, Economic, and Political

Unit II	**Decentralization**	**(08 hrs)**	**COs Mapped - CO1, CO2, CO3, CO4**

Indian tradition of decentralization, History of Panchayat Raj institution in the lost independence period 73rd and 74th amendments, Challenges of caste, gender, class, democracy and ethnicity

Unit III	**Governance**	**(08 hrs)**	**COs Mapped – CO2, CO3, CO4**

Meaning and concepts, Government and governance, Inclusion and exclusion

Text Books

1. Introduction to the Constitution of India, D. D. Basu, Lexis Nexis, 22nd Edition
2. Essays on contemporary India, Bipan Chandra, Har-Anand Publications.

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Three Assignments on unit-1, Unit-2, Unit-3 & 4	30
2	Group Presentation on Unit-5	10
3	LMS Test on Each Unit	10
	Total	**50**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S.Y. B. Tech. Computer Engineering
Pattern 2023 Semester: III
2301210:Design Thinking

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory :01 hr/week **Practical: 02 hrs/week**	**01** **01**	**Tutorial: 25 Marks** **Termwork: 25 Marks**

Prerequisite Courses : FYE 221015 Engineering Exploration

Companion Course:- -

Course Objectives:

- To understand concepts of design thinking
- To understand different phases of design thinking

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Explain stages and process of design thinking	2- Understand
CO2	Identify the methods to empathize and define the problem	3- Apply
CO3	Apply the ideation techniques for problem solving	3- Apply
CO4	Construct the prototype to evaluate a design	3- Apply
CO5	Apply testing techniques to improve the performance.	3- Apply

COURSE CONTENTS

Unit I	**Overview of Design Thinking Process**	**(02 hrs)**	**CO1**

Introduction to DesignThinking - Definition, Ideas, Inventions, Innovations, Origin of Design Thinking, Importance of Design Thinking, Problem solving, Design Thinking tools.
Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test.

Week 1:https://drive.google.com/drive/folders/19wC_ynKlyLYdnPRV_aNrxIsUBvt9UcNo?usp=share_link

Unit II	**Empathy and Define**	**(02 hrs)**	**CO2**

Empathy - How to emphasize, Role of empathy in Design Thinking, Purpose of empathy maps, Things to be done prior to empathy mapping, Customer journey mapping.
Define -How might we questions, The Five Whys Method.

Week 2:https://drive.google.com/drive/folders/1UT_eELRZJ4g0CtYNkjJh4klcEBvpFvsi?usp=share_link

Unit III	**Ideation**	**(02 hrs)**	**CO3**

Idea generation - Basic design directions, Themes of Thinking, Inspiration and references,Brainstorming, Value, Inclusion, Sketching, Presenting ideas, Refinement, Thinking in images, Thinking in signs, Appropriation, Humour, Personification, Visual metaphors.

Week 3:https://drive.google.com/drive/folders/1EPW5wZJtGd0P8y3-ixkHMbvnM_VUq3wC?usp=share_link

Unit IV	Prototype	(02 hrs)	CO4
Prototyping- Assumptions during the Design Thinking process, Storyboards, Models and prototypes, Quick and Dirty Prototyping, Validation in the market, Best practices of presentation.			
Week 4:https://drive.google.com/drive/folders/111xxzuCbCZ75Ut7jm5wVEAzotQprX_et?usp=share_link			
Unit V	**Testing and Implementation**	**(02 hrs)**	**CO5**
Test Phase –Technique for interviews and surveys, Kano Model, Desirability testing, Testing prototypes, Obtaining feedback to refine product usability. **Implementation** - Efficiency and effectiveness of innovation and implementation strategies.			
Week 4:https://drive.google.com/drive/folders/111xxzuCbCZ75Ut7jm5wVEAzotQprX_et?usp=share_link			

Text Books

1. Gavin Ambrose, Paul Harris,"DesignThinking", AVA Publishing (UK) Ltd, ISBN:978-2-940411-17-7.
2.Christian Mueller- Rotenberg, "Handbook of DesignThinking - Tips & Tools for how to
3. Design Thinking", "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", ISBN:9780061937743

Reference Books

1. Idris Mootee, Wiley,"Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", ISBN: 978-1-118-62012-0
2. Jeanne Liedtka,Tim Ogilvie,"Designing for Growth: A Design Thinking ToolKit for Managers",Columbia University Press, ISBN: 0231158386, 9780231158381

MOOC Course

1. Design Thinking - A Primer: Prof. Bala Ramadurai- https://archive.nptel.ac.in/courses/110/106/110106124

Strength of CO-PO/PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	-	-	-	-	-	2	-	-	-	-	3	2
CO2	2	2	-	-	-	-	-	2	-	-	-	-	2	2
CO3	3	3	3	-	-	-	-	2	-	-	-	-	2	-
CO4	2	3	3	-	-	-	-	2	-	-	-	-	-	-
CO5	2	2	3	-	-	-	-	2	-	-	-	-	-	-
Average	2.66	2.66	1.50	-	-	-	-	2	-	-	-	-	2.33	2

Design Thinking Laboratory

List of Tasks

Sr. No.	Tasks to be performed	COs Mapped
1	Creating teams, assigning roles and responsibilities	CO1
2	Empathy : Brainstorming, ideation and setting actionable goal statements	CO1, CO2
3	Identify stakeholders, people/organization, problems and opportunities, prepare questionnaire and discuss with stakeholders	CO1, CO2
4	Draw mind maps	CO1, CO2
5	Construct empathy map	CO2
6	Develop customer journey map	CO1, CO3

7	Identify required skills and techniques to solve listed problems	CO1, CO2, CO3
8	Enlist all possible solutions	CO1, CO2,CO3
9	Make a prototype for user testing	CO4
10	Test the prototype	CO5

Guidelines for Laboratory Conduction

- Students will work in a group, preferably 4-6 students per group.
- Entire project work is divided into 10 tasks.
- Faculty is to monitor progress of each task during phases of project work.

Guidelines for students Lab Journal

Students will submit the term work in the form of a project report at the end of semester.

Guidelines for Term work Assessment

Each task carries 30 marks based on the following rubrics.

R1: Timely completion	10 Marks
R2: Understanding	10 Marks
R3: Documentation	10 Marks

Final presentation: 30 Marks Final
project report : 30 Marks

K. K. Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. Pattern 2023 Semester: IV (Computer/IT/CSD/AIDS) 2300211A: Probability & Statistics		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03hrs/week	**03**	**Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks**

Prerequisite Courses: - Basic concepts of statistics and probability.

Course Objectives: To make the students familiarize with concepts and techniques in Statistical methods & Probability theory.

Course Outcomes: On completion of the course, students will be able to

	Course Outcomes	**Bloom's Level**
CO1	Define and understand basic concept of Statistics and Probability	2-Understanding
CO2	Apply the basic concepts of statistics to real life problems	3- Apply
CO3	Apply the basic concepts of probability distribution theory to real life problems	3- Apply
CO4	Analyze real life problems by using theory of statistics and Probability distribution	4-Analyze
CO5	Evaluate real life problems by using theory of statistics and Probability distribution	5-Evaluate

COURSE CONTENTS

Unit I	**Descriptive measures**	**(08hrs)**	**Cos Mapped CO1, CO2, CO4, CO5**

Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance, Standard Deviation, Range), coefficients of variation, Moments, Skewness and Kurtosis.

Unit II	**Random Variable & Distribution functions**	**(7hrs)**	**Cos Mapped CO1, CO3, CO4, CO5**

Random Variable, Distribution functions (Continuous and discrete), Properties of distribution function, Probability mass function (p.m.f.), Probability density function (p.d.f.) and Cumulative distribution function (Continuous and discrete).

Unit III	**Probability distributions**	**(7hrs)**	**Cos Mapped CO1, CO3, CO4, CO5**

Mathematical expectation and Generatingfunction: Mathematical Expectation, Properties of expectation, Moment generating function
Probability distributions: Geometric, Binomial, Poisson, Uniform Distribution, Normal distribution, Standard Normal, Uniform.

Unit IV	**Bivariate Distribution Functions**	**(7hrs)**	**Cos Mapped CO1, CO3, CO4, CO5**

Joint and Marginal Probability Mass Function, Joint and Marginal Probability Density Function and Conditional Probability Functions.

Unit V	Correlation and Regression	(7hrs)	Cos Mapped CO1, CO2, CO4, CO5

Covariance, Concept of correlation, Karl's Pearson's Coefficient of Correlation, Rank correlation coefficient, Spearman's rank Correlation coefficient. Regression: Lines of regression, Regression coefficients. Fitting of Curve: Fit Straight Line, Parabola and Exponential curves.

Text Books

1. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics, S. Chand & Sons, Tenth revised edition.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.
3. J. Medhi, "Statistical Methods: An Introductory Text", Second Edition, New Age International Ltd.

Reference Books

1. Glen Cowan, "Statistical Data Analysis", University of Siegen, Clarendon Press, Oxford.
2. Montgomery Douglas C, "Applied Statistics and probability for Engineers", Fifth Edition, New Delhi; Wiley India Pvt. Ltd.
3. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	--	--	--	--	--	--	--	--	--	2
CO2	3	2	1	--	1	--	--	--	--	--	--	2
CO3	3	2	1	--	1	--	--	--	--	--	--	2
CO4	3	2	1	1	1	--	--	--	--	--	--	2
CO5	3	2	1	1	1	--	--	--	--	--	--	2
Average	3	2	1	1	1	--	--	--	--	--	--	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Tests on each unit using LMS (Each test for 15 M and total will be converted out of 05 M)	05
2	Problem solving through Computational Software	05
3	Tutorial (1 tutorial on each unit for 15 marks and total will be converted out of 05 M)	05
4	Group Presentation on real life problem	05

Topics for Tutorial		
Sr. No.	**Title**	**CO Mapped**
1	Examples on descriptive measures.	**CO1, CO2, CO4, CO5**
2	Examples on Probability density function (p.d.f.) and Cumulative distribution function (Continuous and discrete).	**CO1, CO3, CO4, CO5**
3	Examples on Mathematical Expectation, Properties of expectation, Moment generating function.	**CO1, CO3, CO4, CO5**
4	Examples on bivariate distribution functions.	**CO1, CO3, CO4, CO5**
5	Examples on correlation and regression.	**CO1, CO2, CO4, CO5**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: IV** **2301212: Data Structures**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: -2300118A: Computational Thinking and Problem Solving

Companion Course: 2301214: Data Structures Lab

Course Objectives:

- To understand basic concepts and terminology of algorithms and data structures
- To study data structures arrays, linked lists, stack, queues and hash tables
- To learn sorting methods
- To select appropriate data structures to solve a given problem

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Describe the fundamental concepts and terminology of data structures and algorithms, including arrays, linked lists, stacks, queues, Hashing and sorting algorithms	2-Understand
CO2	Identify appropriate data structures such as Array, linked list, stack , queue and Hash Tables to solve a given problem	3-Apply
CO3	Design and Develop an algorithms for array and linked list operations such as insertion, and deletion etc.	3-Apply
CO4	Use stack and / or queue to solve the given problem	3-Apply
CO5	Apply the hash table ,concepts of collision resolution methods to solve the given problem	3-Apply

COURSE CONTENTS

Unit I	**Introduction to Data Structures** and **Algorithms**	**(09hrs)**	**CO1, CO2, CO3**

Basics Concepts-Data, Data objects, Data types, Data structure, Abstract Data Types (ADT), Primitive and non primitive, linear and nonlinear, static and dynamic, persistent and ephemeral data structures
Algorithms-Introduction, Characteristics, Analysis of algorithms Complexity of algorithms- Space complexity, Time complexity, Big O notation
Sequential Organization- Concept, Array as an abstract data type, Memory representation and address calculation, Inserting and deleting an element,
Sorting -stability in sorting, internal Sorting methods, Quick sort, merge sort, shell sort, radix sort, concept of external sorting

Unit II	**Multidimensional Arrays and Memory Representation**	**(08 hrs)**	**CO1, CO2, CO3**

Multidimensional arrays and memory representation.
Single Variable Polynomial-Representation, evaluation and addition
Sparse Matrix-Sparse matrix representation, addition, simple transpose, fast transpose
String- Operations using arrays.

Unit III	Linked Lists	(08hrs)	CO1, CO2, CO3

Linked lists-Concept, Linked list as an Abstract data type, Comparison of sequential and linked organizations Realization of Linked list- using arrays, using dynamic memory management, header node, advantages and disadvantages of linked list

Linked list operations-Insert a node, delete a node, traverse, copy, reverse, concatenate, delete list

Types of linked list-Linear, circular , Doubly linked list and operations, introduction to GLL

Unit IV	Stack & Queue	(09hrs)	CO1, CO2, CO4

Stacks-Concept, Stack as an ADT, Representation of stacks using array and linked list, stack operations, Multi-stacks Applications of Stack- Polish notation, expression conversion and evaluation, Processing of function calls and Returns

Recursion- Concept, Types of recursion-Direct recursion

Queues- Concept, Queue as ADT, Realization of queues using arrays and linked list, Circular queue, Deque, Multi-queues, Linked queue and operations.

Applications of Queue: Scheduling, Josephus problem

Unit V	Hashing	(06hrs)	CO1, CO2, CO5

Hash table Concepts-Hash function, bucket, Collision, Probe, Synonym, Overflow, Open hashing, Closed hashing, Perfect hash function, Load density, Full table, Load factor, Rehashing, Basic operations, Issues in hashing

Hash functions- Properties of good hash function, Division, Multiplication, Extraction, Mid-square, folding and universal

Collision resolution Strategies-Open addressing and Chaining, Hash table overflow- Open addressing and Chaining, Closed addressing and Separate chaining.

Text Books

1. Horowitz, Sahani, Dinesh Mehata, “Fundamentals of Data Structures in C++”, Galgotia Publisher, ISBN: 8175152788, 9788175152786

2. J. Tremblay, P. Soresan, “An Introduction to data Structures with applications”, TMH Publication, 2nd Edition, 1984. ISBN:0-07-462471-7

Reference Books

1. Sartaj Sahani, “Data Structures, Algorithms and Applications in C++”, Second Edition, University Press, ISBN:9788173715228

2. G A V Pai, “Data Structures and Algorithms”, McGraw-Hill Companies, ISBN:9780070667266

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit-1, Unit-2, Unit-3 , Unit-4, Unit-5 (each Quiz is of 10 marks will be converted to 20 Marks out of 50)	20
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2023-24)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: IV** **2301213: Software Engineering**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation:** 20 Marks **InSem Exam:** 20 Marks **EndSem Exam:** 60 Marks

Prerequisite Courses: - 2300118A: Computational Thinking and Problem Solving

Companion Courses:-

Course Objectives:

- To learn and understand the principles of Software Engineering.
- To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
- To apply design and testing principles to software project development.
- To understand project management through life cycle of the project.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Identify and apply process model for software development	2-Understand
CO2	Analyze and model software requirements for a given application	3-Apply
CO3	Determine software project scheduling and estimation	3-Apply
CO4	Design and model a given software system	3-Apply
CO5	Design test cases for the software system using verification and validation approaches	3-Apply

COURSE CONTENTS

Unit I	**Introduction to Software Engineering and Software Process Models**	**(08 hrs)**	**CO1**

Software Engineering Fundamentals: Introduction to software engineering, The Nature of Software, Defining Software, Software Engineering Practice.
Software Process: A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models,
Agile software development: Extreme and Scrum Agile methods, Plan driven and Agile development.
Agile Tools- JIRA

Unit II	**Software Requirements Engineering and Analysis**	**(07 hrs)**	**CO2**

Modeling: Requirements Engineering, Establishing the Groundwork, Identifying Stakeholders, Recognizing Multiple Viewpoints, working toward Collaboration, Asking the First Questions, Eliciting Requirements, Collaborative Requirements Gathering, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements.

Unit III	**Estimation and Scheduling**	**(07hrs)**	**CO3**

Estimation for Software Projects: The Project Planning Process, Defining Software Scope and

Checking Feasibility, Resources management, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem-Based Estimation, LOC-Based Estimation, FP-Based Estimation, Process-Based Estimation, Estimation with Use Cases, Reconciling Estimates, Empirical Estimation Models,

Project Scheduling: Defining a Task for the Software Project, Scheduling.

Unit IV	**Design Engineering**	**(07hrs)**	**CO4**

Design Concepts: Design within the Context of Software Engineering, The Design Process, Software Quality Guidelines and Attributes, Design Concepts - Abstraction, Architecture, design Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring, Object-Oriented Design Concept, Design Classes, The Design Model , Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Component Level Design for Web Apps, Content Design at the Component Level, Functional Design at the Component Level, Deployment-Level Design Elements.

Architectural Design: Software Architecture, What is Architecture, Why is Architecture Important, Architectural Styles, A brief Taxonomy of Architectural Styles.

Unit V	**Software Testing**	**(07hrs)**	**CO5**

A Strategic Approach to Software Testing, Verification and Validation, Organizing for Software Testing, Software Testing Strategy—The Big Picture, Criteria for Completion of Testing, Strategic Issues, Test Strategies for Conventional Software, Unit Testing, Integration Testing, Test Strategies for Object-Oriented Software, Unit Testing in the OO Context, Integration Testing in the OO Context, Test Strategies for WebApps, Validation Testing, Validation-Test Criteria, Configuration Review.

Use of testing tools like Selenium, JUnit.

Text Books

1. Roger Pressman, “Software Engineering: A Practitioner‘s Approach”, McGraw Hill, ISBN 0–07–337597–7

2. Ian Sommerville, “Software Engineering”, Addison and Wesley, ISBN 0-13-703515-2

Reference Books

1. Carlo Ghezzi, “Fundamentals of Software Engineering", PHI, ISBN-10: 0133056996

2. Rajib Mall, “Fundamentals of Software Engineering”, PHI, ISBN-13: 978-8120348981

3. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Springer, ISBN 13: 9788173192715.

Strength of CO-PO PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	-	-	-	-	-	-	-	3	-	3
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
CO4	3	3	3	3	-	3	3	3	-	-	-	3	-	3
CO5	3	-	2	-	-	-	-	-	-	-	-	3	-	3
Average	3.00	3.00	2.67	2.25	-	3.00	3.00	3.00	-	-	-	2.83	-	3.00

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit 1, Unit-2, Unit-4, Unit 5 (Quiz 15 marks each and will be converted to 15 Marks)	15
2	Theory assignment on Unit-3 (One Assignment on Unit III of 10 marks will be converted to 5 (Marks)	5
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: IV** **2301214: Java Programming Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Termwork: 25 Marks** **Practical Exam : 25 Marks**
Prerequisite Courses: - 2300118A: Computational Thinking and Problem Solving **2301205: Object Oriented Programming and Computer Graphics Lab**		
Companion Courses:-		

Course Objectives:

- To understand object-oriented concepts in Java such as data abstraction, encapsulation, inheritance and polymorphism
- To studythe concept of packages and interfaces
- To understand the concepts of exception handling and multithreading.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply inheritance, polymorphism, file handling to solve real world problems	3-Apply
CO2	Make use of concepts of abstract classes, packages and Interfaces	3-Apply
CO3	Apply multithreading and exception handling to solve real world problems	3-Apply
CO4	Develop an application using object oriented features of Java	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1.	Write a Menu driven program in Java to implement banking application. Application should read the customer name, account number, initial balance, rate of interest, contact number and address field etc. Application should have following methods. i. createAccount() ii. deposit() iii. withdraw() iv. computeInterest() v. displayBalance()	CO1
2.	Write a Java program to initialize and refer instance of class having parameterized constructor using this keyword. Make use of static keyword.	CO1
3.	Write a Java program to perform different operations on String. i. charAt() ii. compareTo() iii. concat() iv. equals()	CO1

	v. replace() vi. split() vii. trim()	
4.	Write Java program to create a super class called “Shape” that receives the dimensions of objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from “Shape”. Each of the sub class overrides area() so that it returns the area of a rectangle and a triangle respectively	CO1
5.	Write a Java program to calculate electricity bill for commercial and domestic plan using abstract class	CO2
6.	Write a Java program to accept a file name and display number of characters,words and lines in the files	CO1
7.	Write a Java program to create an interface named as“Sortable” with a method sort() that sorts an array of integers in ascending order. Create two classes BubbleSort and SelectionSort that implement the “Sortable” interface and provide their own implementations of the sort() method	CO2
8.	Write a Java program to create calculator for performing arithmetic operations using packages	CO2
9.	Write a JAVA program to create User defined exception to check the following conditions and throw the exception if the criterion does not met. i. User has age between 18 and 55 ii. User has income between Rs. 50,000 –Rs. 1,00,000 per month iii. User stays in Pune / Mumbai/ Bangalore / Chennai iv. User has 4-wheeler Accept age, Income, City, Vehicle from the user and check for the conditions mentioned above.If any of the condition not met then throw the exception	CO3
10.	Write a Java program to implement a producer-consumer problem using the wait() and notify() methods for thread synchronization.	CO3
11.	Develop a Miniproject using maximum features of Java Programming.	CO4
Additional programming Problems		
1	Write a Java program to create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports	CO1, CO2
2	Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In each subclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.	CO1
3	Write a Java program that creates two threads to find and print even and odd numbers from 1 to 20.	CO1, CO3

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation and comments.
Use of open source software is to be encouraged.
Operating System recommended: - Linux or its derivative
Programming tools recommended: - JDK environment

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form

Guidelines for Termwork Assessment
Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10) (Coding standard, Indentation, Hungarian notation, input validation etc)

Strength of CO-PO/PSO Mapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	-	2	-	-	-	-	-	-	3	3	2
CO2	3	3	3	-	2	-	-	-	-	-	-	3	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	3	3	2
CO4	3	3	3	3	2	-	-	-	-	-	-	3	3	2
Average	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: IV** **2301215: Data Structures Lab**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 04 hrs/week	**02**	**Termwork: 50 Marks** **Practical Exam : 50 Marks**

Prerequisite Courses: - 2300118A: Computational Thinking and Problem Solving, 2300108A: Programming in C

Companion Course: 2301211: Data Structures

Course Objectives:

- To understand basic concepts and terminology of algorithms and data structures
- To study data structures arrays, linked lists, stack , queues and hash tables
- To learn sorting methods
- To select appropriate data structures to solve a given problem

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Demonstrate the ability to choose and implement appropriate data structures such as Array, linked list, stack , queue and Hash Tables to solve a given problem	2-Understand
CO2	Implement an algorithms for array and linked list operations such as insertion, and deletion etc using C++	3-Apply
CO3	Make use of stack and / or queue to solve the given problem	3-Apply
CO4	Apply the hash table ,concepts of collision resolution methods to solve the given problem	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	**Set operations:** Write a menu driven C++ program to store sets for students' names participating in different events in Equinox such as Coding contest, Project competition, Paper Presentation, MasterMind etc. 1. Find out participants who have participated in Coding and Project both 2. Find out participants who have participated in Coding or Project competition or both or Mastermind 3. Find out participants who have participated in Coding but not in Master mind Find out participants who have participated in all events	CO1,CO2
2	**Knight's tour:** The problem is to move the knight, beginning from any given square on the chessboard, in such a manner that it travels successively to all 64 squares, touching each square once and only once. It is convenient to represent a solution by placing the numbers 1,2, ...,64 in the squares of the chessboard indicating the order in which the squares are reached. Note that it is not required that the knight be able to reach the initial position by one more move; if this is possible the knight's tour is called re-entrant. One of the more ingenious methods for solving the problem of the knight's tour is that given by J. C. Warnsdorff in 1823. His rule is that the knight must always be moved to one of the squares from	CO1,CO2

	which there are the fewest exits to squares not already traversed. Write a C++ program to implement Warnsdorff's rule and show it graphically. OR **Random walk**: A (drunken) cockroach is placed on a given square in the middle of a tile floor in a rectangular room of size n x m tiles. The bug wanders (possibly in search of an aspirin) randomly from tile to tile throughout the room. Assuming that it may move from his present tile to any of the eight tiles surrounding it (unless it is against a wall) with equal probability, how long will it take him to touch every tile on the floor at least once? Write a C++ program to graphically show a random walk of a (drunken) cockroach and find the no of moves made.	
3	**String Operations:** Write a menu driven C++ program with a class for String. Write functions 1. To determine the frequency of occurrence of a particular character in the string. 2. Extract a new string from original string by accepting starting position and length 3. To accept any character and return the string with by removing all occurrences of a character accepted 4. To make an in-place replacement of a substring w of a string by the string x. Note that w may not be of same size that of x 5. To check whether given string is palindrome or not	CO1,CO2
4	**Sparse Matrix:** Write a menu driven C++ program with class for Sparse Matrix. Write functions to perform Sparse Matrix operations as listed below 1. Read sparse matrix 2. Display sparse matrix 3. Add two sparse matrices 4. Find transpose using Simple transpose algorithm 5. Find transpose using Fast transpose algorithm Compare complexity of simple and fast transpose using counter.	CO1,CO2
5	**Polynomial operations:** Write a menu driven C++ program with class for single variable polynomial and write functions to perform following polynomial operations using arrays 1. Read polynomial 2. Display polynomial 3. Add two polynomials You can try above polynomial operation using Linked list	CO1,CO2
6	**Appointment Management:** Write a menu driven C++ program for storing appointment schedules for the day. Appointments are booked randomly using linked lists. Set start and end time for visit slots. Write functions for 1. Display free slots 2. Book appointment 3. Cancel appointment (check validity, time bounds, availability etc) 4. Sort list based on time 5. Sort list based on time using pointer manipulation	CO1,CO2
7	**Expression conversion**: Write a menu driven C++ program for expression conversion and evaluation 1. infix to prefix 2. prefix to postfix 3. prefix to infix 4. postfix to infix 5. postfix to prefix	CO1,CO2, CO3

8	**String operations:** A palindrome is a string of characters that's identical when read in forward and backward direction. Typically, punctuation, capitalization, and spaces are ignored. For example, "1.Poor Dan is in a droop!!" is a palindrome, as can be seen by examining the characters "poordanisinadroop" and observing that they are identical when read forward and backward directions. One way to check for a palindrome is to reverse the characters in the string and compare them with the original-in a palindrome, the sequence will be identical. Write C++ program with functions using Standard Template Library (STL) stack- 1. To print original string followed by reversed string using stack 2. To check whether given string is palindrome or not	CO1,CO2, CO3
9	**Simulation of pizza parlor**: Pizza parlor accepting maximum M orders. Orders are served on a first come first served basis. Order once placed cannot be canceled. Write C++ program to simulate the system using simple queue or circular queue	CO1,CO2, CO3
10	**Sorting:** Write a C++ menu driven program to store the percentage of marks obtained by the students in an array. Write function for sorting array of floating point numbers in ascending order using 1. Selection Sort 2. Bubble sort 3. Insertion sort 4. Shell Sort 5. Quick sort 6. Radix sort 7. Display top five scores Implement any 4 methods of sorting. Provide choice to user to take input from user or using random numbers. Use Standard Template Library (STL) sort function	CO1,CO2
11	**A Dictionary using Hash table**: A Dictionary stores key and value pairs Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique. Standard Operations: Insert(key, value), Find(key), Delete(key) Write a menu driven C++ program to provide above standard operations on dictionaries Write a menu driven C++ program to provide all the functions of a dictionary (ADT) using hashing and handle collisions using chaining.	CO1,CO2, CO4
12	A list of data representing various environmental parameters such as temperature, humidity, pollution levels, etc is maintained using appropriate data structure. Write a C++ program that uses data structures to perform the following operations: 1. Find the maximum and minimum values of each parameter in the list. 2. Calculate the average value of each parameter in the list. 3. Sort the list in ascending order of any one parameter. 4. Find the highest and lowest values of any one parameter that are considered safe for the environment. 5. Calculate the impact of the parameter values on the environment based on certain pre-defined criteria. 6. Analyze the impact of the environmental parameters on the health and safety of the society. 7. Ensure that the program follows ethical and professional practices, such as ensuring the privacy and security of the data. You should implement the program using appropriate data structures that take into account the size and complexity of the data, and demonstrate an understanding of the societal and environmental issues related to the data.	CO1,CO2

	Your program should also demonstrate an understanding of the impact of the parameter values on the environment, and the need for sustainable development. Finally, your program should adhere to ethical principles and professional practices, such as ensuring the confidentiality, privacy, and security of the data	
Mini Project		
	Develop a mini project in a group Following is the sample problem statements based on concepts learned in the course 1. Implement an efficient system to monitor and analyze sound pollution levels in a given area. The system should be able to store and process large amounts of sound data, and provide relevant insights and visualizations to help identify areas of high sound pollution. The system should have the following functionalities: • Data Collection: Collected sound data from various sources, such as sound sensors or microphones is stored in a structured format as a file system. • Data Processing: The system should be able to process the collected data to identify patterns and trends in sound pollution levels. This could involve tasks such as noise filtering, signal processing, and feature extraction. • Data Analysis: The system should be able to analyze the processed data to provide insights into sound pollution levels in a given area. This could involve tasks such as trend analysis, outlier detection, and clustering. • Visualization: The system should be able to provide relevant visualizations to help identify areas of high sound pollution. This could involve tasks such as heat map generation, time-series plotting, and spatial analysis. The system should be designed to handle large volumes of sound data efficiently and provide real-time or near-real-time analysis and visualization. The implementation of the system should be efficient in terms of space and time complexity, and should be scalable to handle increasing volumes of data. Students are free to implement any other relevant mini project problem statement as follows. 2. Operations on Big number 3. Appointment management 4. Phone book operations 5. Sorting methods simulation and comparison	CO1 to CO4
Additional programming Problems		
1	**Binary Number operations:** Write a C++menu driven program for storing binary numbers using doubly linked lists. Write functions- 1. To compute 1‘s and 2‘s complement 2. Add two binary numbers	CO1, CO2
2	**Eight Queens:** A classic problem that can be solved by backtracking is called the Eight Queens problem, which comes from the game of chess. The chess board consists of 64 squares arranged in an 8 by 8 grid. The board normally alternates between black and white squares, but this is not relevant for the present problem. The queen can move as far as she wants in any direction, as long as she follows a straight line, Vertically, horizontally, or diagonally. Write C++ program with a recursive function for generating all possible configurations for 8-queen's problem.	CO1, CO2, CO3

3	**DEQUE:** A double-ended queue (deque) is a linear list in which additions and deletions may be made at either end. Obtain a data representation mapping a deque into a one-dimensional array. Write C++ menu driven program to simulate deque with functions to add and delete elements from either end of the deque. Also implement using STL	CO1, CO2, CO3
4	Design and implement a hash table to efficiently store and manage a student database. The student database contains the following information for each student: Student ID, Name, Age, and GPA. The system should support the following operations: insert, search, delete student and Analyze the time complexity of key operations	CO1, CO2, CO5

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation and comments.
Use of open source software is to be encouraged.
Operating System recommended: - Linux or its derivative
Programming tools recommended: - Open Source line gcc/g++

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form

Guidelines for Termwork Assessment

Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10) (Coding standard, Indentation, Hungarian notation, input validation etc)

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. (Computer Engineering)
Pattern 2023 Semester: IV
2301216: Data Communication and Networking

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses: - 2301201: Discrete Structures

Course Objectives:
- To introduce the fundamental various types of computer networks.
- To Analyze Data Communication
- To explore the various layers of OSI Model
- Explore Transport Layer Concepts
- Examine Application Layer Protocols

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies	2-Understand
CO2	Illustrate the working and functions of data link layer	2-Understand
CO3	Analyze the working of different routing protocols and mechanisms	3-Apply
CO4	Understand Elements of Transport Layer Protocols	2-Understand
CO5	Illustrate role of application layer with its protocols, client-server architectures	2-Understand

COURSE CONTENTS

Unit I	**Data Communications**	**(06 hrs)**	**CO1**

Introduction to Data Communication, importance of data communication. Modes of Data Transmission, Signals and Modulation, Data Transmission Concepts(Bandwidth,Data,Rate,Latency), Data Transmission Modes, Error Detection and Correction, Protocols and Standards (e.g., TCP/IP, OSI model), Network Models(OSI,TCP/IP), Multiplexing, Media Access Control (MAC)

Unit II	**Data Link Layer**	**(08 hrs)**	**CO2**

Introduction, functions. Design Issues: Services to Network Layer, Framing, Addressing, Flow Control Protocall: Stop-and-Wait Protocol, The Go-Back-N ,Sliding Window Protocol, Automatic Repeat request (ARQ), Error Control, Address Resolution Protocol (ARP),L logical Link Control (LLC), Frame Synchronization, Fragmentation and Reassembly

Unit III	**Network Layer**	**(08hrs)**	**CO3**

Introduction: Functions of Network layer. Switching Techniques: Circuit switching, Message Switching, Packet Switching. IP Protocol: Classes of IP (Network addressing), IPv4, IPv6, Network Address Translation, Sub-netting, CIDR. Network layer Protocols: ARP, RARP, ICMP, IGMP. Network Routing and Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing, Link State Routing, Path Vector. Routing Protocols: RIP, OSPF, BGP

Unit IV	**Transport Layer**	**(08hrs)**	**CO4**

Process to Process Delivery, Services, Socket Programming. Elements of Transport Layer Protocols: Addressing, Connection establishment, Connection release, Flow control and buffering,Multiplexing, Congestion Control. Transport Layer Protocols: TCP and UDP, SCTP, RTP, Congestion control and Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless networks

Unit V	**Application Layer**	**(06hrs)**	**CO5**

Introduction, Web and HTTP, Web Caching, DNS, Email: SMTP, MIME,POP3, Webmail, FTP, TELNET,DHCP, SNMP, Client-Server Architecture, APIs and Interfaces, Authentication and Authorization, Error Handling and Recovery

Text Books

1. Data Communication and Networking by Behrouz A. Forouzan (Fourth Edition), Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education

Reference Books

1. Kurose, Ross, “Computer Networking a Top Down Approach Featuring the Internet”,Pearson, ISBN-10: 0132856204
2. L. Peterson and B. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan-Kaufmann, 2012.

Strength of CO-PO PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO2	3	3	2	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3	3	3
Average	3	3	2	2	-	-	-	-	-	-	-	3	3	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit 1, Unit-2, Unit-4, (Quiz 15 marks each and will be converted to 15 Marks)	15
2	Theory assignment on Unit-3 and Unit 5	10
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. (Computer Engineering)
Pattern 2023 Semester: IV
2301217: Data Communication and Networking Lab

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Termwork: 25 Marks** **Practical Exam : 25 Marks**

Prerequisite Courses: - 2300108A: Programming In C, 2300117A Python Programming

Course Objectives:

- To learn computer network hardware and software components
- To learn computer network topologies and types of network
- To develop an understanding of various protocols, modern technologies and applications
- To learn modern tools for network traffic analysis
- To learn network programming

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Analyze the requirements of network types, topology and transmission media	3-Apply
CO2	Demonstrate error control, flow control techniques and protocols and analyze them	3-Apply
CO3	Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms	3-Apply
CO4	Develop Client-Server architectures and prototypes	3-Apply
CO5	Implement web applications and services using application layer protocols	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Setup a wired LAN using Layer 2 Switch. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and demonstrating the PING packets captured traces using Wireshark Packet Analyzer Tool.	CO1
2	Demonstrate the different types of topologies and types of transmission media by using a packet tracer tool	CO1
3	Setup a WAN which contains wired as well as wireless LAN by using a packet tracer tool. Demonstrate transfer of a packet from LAN 1 (wired LAN) to LAN2	CO1

	(Wireless LAN).	
4	Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC.	CO2
5	Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in Peer-to-Peer mode.	CO2
6	Write a program to demonstrate Sub-netting and find subnet masks	CO3
7	Write a program to implement link state /Distance vector routing protocol to find suitable path for transmission	CO3
8	Write a program using TCP socket for wired network for following a. Say Hello to Each other b. File transfer c. Calculator	CO1,CO4
9	Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines.	CO1,CO4
10	Write a program for DNS lookup. Given an IP address as input, it should return URL and vice-versa.	CO4
11	Capture packets using Wireshark, write the exact packet capture filter expressions to accomplish the following and save the output in file: 1. Capture all TCP traffic to/from Facebook, during the time when you log in to your Facebook account 2. Capture all HTTP traffic to/from Facebook, when you log in to your Facebook account 3. Write a DISPLAY filter expression to count all TCP packets (captured under item #1) that have the flags SYN, PSH, and RST set. Show the fraction of packets that had each flag set. 4. Count how many TCP packets you received from / sent to Face book, and how many of each were also HTTP packets.	CO4
12	Analyze the performance of HTTP, HTTPS and FTP protocol using Packet tracer tool.	CO5
14	**Mini Project:** Installing and configuring DHCP server and assign IP addresses to client machines using DHCP server.	CO1 to CO5
programming Problems		
1	To study the SSL protocol by capturing the packets using Wireshark tool while visiting any SSL secured website (banking, e-commerce etc.).	CO3
2	Illustrate the steps for implementation of S/MIME email security, POP3 through Microsoft Office Outlook.	CO4
Guidelines for Laboratory Conduction		
Use of coding standards and Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged. Operating System recommended: - Linux or its derivative Programming tools recommended: - Open Source line gcc/g++		
Guidelines for Student's Lab Journal		
The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement,		

theory concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form
Guidelines for Termwork Assessment
Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10) (Coding standard, Indentation, Hungarian notation, input validation etc)

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tec Computer Engineering
Pattern 2023 Semester: IV
2301218: Customer Relationship Management

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02 hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks**

Prerequisite Courses:-

Companion Courses:-

Course Objectives:
- To understand the concepts and principles of CRM
- To understand the role and changing face of CRM as an IT enabled function.
- To enable managing Customer Relationship.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Understand the nuance of customer relationship	2-understand
CO2	Make a use of various CRM concepts.	3-Analyze
CO3	Understand of the Role of CRM in sales of the company	2-understand
CO4	Understand the different CRM models in service industry	2-understand
CO5	Analyze the different issues in CRM	4-Analyze

COURSE CONTENTS

Unit I	Evolution of Customer Relationship	**(04 hrs)**	**CO1**

CRM- Definition, Emergence of CRM Practice, Factors responsible for CRM growth, CRM process, framework of CRM, Benefits of CRM, Types of CRM, Scope of CRM, Customer Profitability, Features Trends in CRM.

Unit II	CRM Concepts	**(06 hrs)**	**CO2**

Customer Value, Customer Expectation, Customer Satisfaction, Customer Centricity, Customer Acquisition, Customer Retention, Customer Loyalty, Customer Lifetime Value. Customer Experience Management, Customer Profitability, Enterprise Marketing Management, Customer Satisfaction Measurements, Web based Customer Support.

Unit III	Planning for CRM	**(06hrs)**	**CO3**

Steps in Planning-Building Customer Centricity, Setting CRM Objectives, Defining Data Requirements, Planning Desired Outputs, Relevant issues while planning the Outputs, Elements of CRM plan, CRM Strategy: The

Strategy Development Process, Customer Strategy Grid.

Unit IV	Marketing Strategy	**(04hrs)**	**CO4**

CRM Marketing Initiatives, Sales Force Automation, Campaign Management, Call Centres. Practice of CRM: CRM in Consumer Markets, CRM in Services Sector, CRM in Mass Markets, CRM in Manufacturing Sector.

Unit V	CRM Planning and Implementation	**(04hrs)**	**CO5**

Issues and Problems in implementing CRM, Information Technology tools in CRM, Challenges of CRM Implementation. CRM Implementation Roadmap, Road Map (RM) Performance: Measuring CRM performance, CRM Metrics.

Text Books

1. Francis Buttle, Stan Maklan, Customer Relationship Management: Concepts and Technologies, 3rd edition, Routledge Publishers, 2015
2. 2. Kumar, V., Reinartz, Werner Customer Relationship Management Concept, Strategy and Tools, 1st edition, Springer Texts, 2014

Reference Books

1. Jagdish N.Sheth, Atul Parvatiyar & G.Shainesh, "Customer Relationship Management", Emerging Concepts, Tools and Application", 2010, TMH.
2. 2. Dilip Soman & Sara N-Marandi," Managing Customer Value" 1st edition, 2014, Cambridge.
3. 3. Alok Kumar Rai, "Customer Relationship Management: Concepts and Cases", 2008, PHI.

Strength of CO-PO PSO Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1	1	-	-	-	-	-	-	-	-	1	1	1
CO2	1	1	1	-	-	-	-	-	-	-	-	1	1	1
CO3	1	1	1	-	-	-	-	-	-	-	-	1	1	1
CO4	1	1	1	-	-	-	-	-	-	-	-	1	1	1
CO5	1	1	1	-	-	-	-	-	-	-	-	1	1	1
Average	1	1	1	-	-	-	-	-	-	-	-	1	1	1

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Quiz on Unit-1, Unit-2, Unit-3 (Quiz 10 marks on each unit and will be converted to 10 Marks)	10
2	Assignment on Unit 4 & Unit 5 (10 marks on each unit and will be converted to 10 Marks)	10
	Total	**20**

K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. Computer Engineering
Pattern 2023 Semester: IV
2301219: Universal Human Values

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 02 hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks** **Total: 50 Marks**

Prerequisite Courses, if any: - NA

Course Objectives:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction withNature.

Thus, this course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	**Evaluate** the significance of value inputs in formal education and start applying them in their life and profession	5
CO2	**Distinguish** between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intentionand Competence of an individual.	4
CO3	**Analyze** the value of harmonious relationship based on trust and respect in their life and profession	4
CO4	**Examine** the role of a human being in ensuring harmony in society and nature.	4
CO5	**Apply** the understanding of ethical conduct to formulate the strategy for ethical life and profession.	3

COURSE CONTENTS

Unit I	**Introduction-Basic Human Aspiration, its fulfilment through All-encompassing Resolution**	**(05 hrs)**	**COs Mapped - 1**

The basic human aspirations and their fulfilment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution

Unit II	Right Understanding (Knowing)- Knower, Known & the Process	(05 hrs)	COs Mapped – 2
The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).			
Unit III	**Understanding Human Being**	**(05 hrs)**	**COs Mapped – 3**
Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self			
Unit IV	**Understanding Nature and Existence**	**(05 hrs)**	**COs Mapped – 4**
A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).			
Unit V	**Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living**	**(05 hrs)**	**COs Mapped – 5**
Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence			

Text Books

1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course inHuman Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.

Reference Books

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limitsto Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Mode of Evaluation
Based on participation of student in classroom discussions/Self-assessment/Peer assessment/Assignments/ Seminar/Continuous Assessment Test/Semester End Exam Socially relevant project/Group Activities/Assignments may be given importance in this course

Guidelines for Continuous Assessment of Theory Course	
Components for Continuous Comprehensive Evaluation	**Marks Allotted**
Assignment on Unit 1,2	**30**
Group presentations on Unit 3	**10**
LMS test on each unit	**10**
Total	**50**

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Computer Engineering **Pattern 2023 Semester: IV** **2301220: Foreign Language**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 01 hrs/week **Practical :02 hrs/week**	**02**	**Tutorial: 25 Marks** **Termwork: 25 Marks**
Prerequisite Courses: -		
Companion Courses:-		
Course Objectives: ● To learn language		