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

Curriculum

B.Tech

Artificial Intelligence & Data Science

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 Artificial Intelligence & Data Science wef AY 2023-24															
F.Y. B. Tech Artificial Intelligence & Data Science 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**

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	EXIT1	Web Designing using HTML and CSS	2	0	2	20	30	0	0	50	100	2	0	1	3
2300121A	EXIT2	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 Artificial Intelligence & Data Science wef AY2024-25															
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
2311203	PCC	Data Structures	3	-	-	20	60	20			100	3	-	-	3
2301204	PCC	Operating Systems Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2311205	PCC	Data Structures Lab	-	-	4				50	50	100	-	-	2	2
2301206	MDM	Digital Electronics & 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 , e-Governance	-	2	-	-	-	50	-	-	50	-	2	-	2
2311210	VSEC	Advanced Excel	-	1	2	-	-	-	Tut-25 TW-25	-	50	-	1	1	2
		Total	14	03	**10**	**80**	**240**	**180**	**150**	**100**	**750**	14	03	**5**	**22**

S.Y.B.Tech Artificial Intelligence & Data Science wef AY2024-25															
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 and Statistics	3	-	-	20	60	20			100	3	-	-	3
2311212	PCC	Database Management System	3	-	-	20	60	20			100	3	-	-	3
2301213	PCC	Software Engineering	3	-	-	20	60	20			100	3	-	-	3
2311214	PCC	Object Oriented Programming Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2311215	PCC	Database Management System Lab	-	-	4				50	50	100	-	-	2	2
2301216	MDM	Data Communications and Networking	3	-	-	20	60	20	-	-	100	3	-	-	3
2301217	MDM	Data Communications and Networking Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301218	OE	Customer Relationship Management	2	-	-	-	-	50	-	-	50	2	-	-	2
2301219	VEC	Universal Human Values	-	2	-	-	-	50	-	-	050	-	2	-	2
2301220	AEC	Foreign Language	-	1	2	-	-	-	Tut-25 TW-25	-	050	-	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**
2311221	EXIT	Internship	2-weeks			Internship Report						-	2	-	2
2311222	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 Artificial Intelligence & Data Science wef AY2025-26															
SEM-V															
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**
2301301	PCC	Data Structures and Algorithm Design	3	-	-	20	60	20			100	3	-	-	3
2311302	PCC	Artificial Intelligence	3	-	-	20	60	20			100	3	-	-	3
2311303	PCC	Data Science and Big Data	3	-	-	20	60	20			100	3	-	-	3
2311304	PCC	Artificial Intelligence + Data Science and Big Data Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301305	PCC	Data Structures and Algorithm Design 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 & Architecture	3	-	-	20	60	20	-	-	100	3	-	-	3
2311310	CEP	Project Based Learning	-	1	2	-	-	-	50	-	050	-	1	1	2
		Total	**17**	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	**1**	**4**	**22**

Course Code	Course	Title of Course	Teaching Scheme	Evaluation Scheme and Marks	Credits

T. Y..B.Tech Artificial Intelligence & Data Science wef AY2025-26

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
2311311	PCC	Business Intelligence and Analytics	3	-	-	20	60	20			100	3	-	-	3
2301312	PCC	Theory of Computation	3	-	-	20	60	20			100	3	-	-	3
2311313	PCC	Data Science Techniques and Tools Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301314/ 2311314	PEC	Program Elective Course -II	3	-	-	20	60	20			100	3	-	-	3
2301315/ 2311315	PEC	Program Elective Course -III	3	-	-	20	60	20	-	-	100	3	-	-	3
2311316	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
2311319	VSEC	Mobile App Development	-	1	2				25	25	50	-	1	1	2
2311320	RM	Research Seminar	-	-	2	-	-	-	50	-	50	-	-	1	1
		Total	17	**01**	**08**	**100**	**300**	**150**	**125**	**75**	**750**	**17**	1	**4**	**22**

			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 / User Experience Design	3	-	-	20	60	20	-	-	100	3	-	-	3
2311314B		Neural Network and Fuzzy Logic													
2311314C		Web Technology													
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													
2311315C		Cyber Security													
Program Elective Course II + Program Elective Course Lab III Lab(Sem-VI) (Lab based on chosen elective course II and III by students)															
2311316	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
2311321	EXIT	Internship	2-weeks			Internship Report						-	2	-	2
2311322	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 Artificial Intelligence & Data Science 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
2311402	PCC	Generative AI and Prompt Engineering	3	-	-	20	60	20			100	3	-	-	3
2301403	PCC	Deep Learning Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2311404	PCC	Generative AI and Prompt Engineering Lab	-	-	2	-	-	-	25	25	50	-	-	1	1
2301405/ 2311405	PEC	Program Elective Course IV	3	-	-	20	60	20	-	-	100	3	-	-	3
2301406/ 2311406	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
2311409	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 Artificial Intelligence & Data SciencewefAY2026-27															
SEM-VIII															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2311411	PCC*	Data Warehousing	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
2311414	INTERNSHIP	Internship	-	-	24	-	-	-	300	200	500	-	-	12	12
Total			**8**	**00**	**24**	**-**	**200**	**50**	**300**	**200**	**750**	**8**	**-**	**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													
2311405C		Social Network Analysis													
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
2311406B		Computational Intelligence													
2311406C		Software Architecture and Design Pattern													
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													

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(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Artificial Intelligence and Data Science
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**

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(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Artificial Intelligence and Data Science
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. Artificial Intelligence and Data Science
Pattern 2023 Semester: III
2311203 : 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 : 2311205: Data Structures and 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
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S. Y. B. Tech. Artificial Intelligence and Data Science Pattern 2023 Semester: III 2301204: Operating Systems Laboratory		
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: 1 Print the lines that match the given pattern	**CO5**

	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. Artificial Intelligence and Data Science **Pattern 2023 Semester: III** **2301207: Digital Electronics Laboratory**		
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
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S. Y. B. Tech. Artificial Intelligence and Data Science
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

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
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Artificial Intelligence and Data Science **Pattern 2023 Semester: III** **2301207: Digital Electronics Laboratory**		
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
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S. Y. B. Tech. Artificial Intelligence and Data Science **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. WaghInstitute of Engineering Education and Research, Nashik

(Autonomous from Academic Year 2023-24)

S. Y. B. Tech. Artificial Intelligence and Data Science **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: - Basic term of democracy, Importance of Election and governance

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	UnderstandandpracticekeyprinciplesofDemocracy	2-Understand
CO2	IdentifyhowdifferentrightsareprotectedinDemocraticsystems	2-Understand
CO3	UnderstandvariousapproachesforGovernance	2-Understand
CO4	ReflectonthevariousthreatsandchallengestoDemocracy	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 74thamendments, 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. (Artificial Intelligence and Data Science)
Pattern 2023 Semester: III
2311210: Advanced Excel

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

Prerequisite Courses: -

Course Objectives:

- To understand functions of Microsoft Excel
- To store and organize data using spreadsheet (Excel)
- To understand how to analyze data using data visualization, analysis tools and macros

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

	Course Outcomes	Bloom's Level
CO1	Make use of Microsoft excel to store and format a data	3-Apply
CO2	Utilize powerful tools like Vlookup and Advanced Pivot Tables for data analysis	3-Apply
CO3	Make use of data validation functions to validate the data	3-Apply
CO4	Develop impactful charts, graphs and dashboards that effectively Visualize your findings and insights	3-Apply
CO5	Develop an application using advanced tools and Excel Macro	3-Apply

COURSE CONTENTS

Unit I	**Excel Fundamentals and Advanced Functions and Formulas**	**(04 hrs)**	**CO1**

Excel Fundamentals: Basic Excel workbook., sheet text/data management

Advanced Functions and Formulas: Exploring Advanced Mathematical Functions, Mastering Lookup and Reference Functions, Logical Functions, Advanced Text Manipulation with Text Functions

Unit II	**Data Analysis**	**(04 hrs)**	**CO2**

Applying Single / Multiple Filters To Data, Advanced Data Analysis Techniques with PivotTables, PivotTables for Data Summarization

Unit III	**Data validation and conditional formatting**	**(03hrs)**	**CO3**

Conditional formatting, Data Validation, What If analysis, Protecting Your Workbook

Unit IV	**Data Visualization and**	**(03hrs)**	**CO4**

Enhancing Visualizations with Advanced Charting, Interactive Dashboards using PivotCharts and Slicers

Unit V	**Excel Macros**	**(04hrs)**	**CO5**

Excel Macros : Introduction to Excel Macros, Recording and Editing Macros, Introduction to VBA Macro, AI Tools

Text Books
1. John Walkenbach , Michael Alexander, Richard Kusleika, “Excel 2019 Bible”, Wiley; 1st edition December 2018, ISBN: 978-1119514787 2. Karl Brian, “Simplified Practical Guide to Microsoft Excel: Learning Microsoft Excel from Basic to Advanced”, Kindle Edition, ISBN : B09YQ4W7W2
Reference Books
1. M.L. Humphrey, “Excel for Beginners (Excel Essentials Book 1)”, Kindle Edition 2. Ritu Arora, “Mastering Advanced Excel Paperback”, BPB Publications (21 July 2023), ISBN-13 978-9355518651

List of Laboratory Experiments / Assignments

Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Create a dataset containing information about students' scores in various subjects. Perform the following task: 1. Calculate the average score for each student across all subjects 2. Identify students who have scored above the average in at least two subjects 3. Compute the overall average score for each subject 4. Identify the subject(s) with the highest average score 5. Sort the students based on their total scores in descending order 6. Apply filters to retrieve specific data based on various conditions	**CO1,CO2**
2	Create a dataset containing a list of electronics products. Each product has a sales tax of 7.5%. Perform the following task: 1. Using absolute and relative reference calculate total price and sales tax 2. Concatenate the category of product, brand name and model number in to separate column having name “product code”	**CO1,CO2**
3	Create a dataset containing information about students' exam scores in various subjects. Your task is to use Excel functions listed below to make decisions based on the data: 1. Determine whether each student has passed or failed a subject based on their score. If a student's score is 40% or above, they pass; otherwise, they fail using IF function 2. Calculate the total number of students who have passed a particular subject using SUMIF Function 3. Count the number of students who have received distinction in class using COUNTIF	**CO3**
4	Create a dataset containing information about employees and their respective departments and salaries. Your task is to utilize Excel's lookup functions to retrieve and analyze specific information from the dataset.	**CO3**
5	Create a dataset containing the admission statistics of a college over the last 5 years. Use Excel charts to see if there are any trends or patterns in different departments. 1. Line Chart: Display the number of admissions for each department over the past 5 years 2. Bar Chart: Compare the number of admissions for different	**CO4**

	Departments in current academic year 3. Pie Chart: Illustrate the distribution of admitted students based on their geographic location	
6	Create a new Excel workbook and enter sample data into a worksheet (e.g., student names, scores, grades). Perform the following operations on the given data: 1. Record a macro to perform a simple task, such as formatting the data, sorting it, or calculating statistics. 2. Edit the recorded macro using the VBA editor to understand the generated code and make simple modifications 3. Test the macro by running it on the sample data and verify that it performs the intended tasks correctly	**CO4**
7	Create a dataset with columns as (e.g., Date, Product, Sales Amount). Design the layout of the dashboard, including titles, headings, and placeholders for charts and summary tables for following 1. Identify the key performance indicators (KPIs) to be visualized, such as total sales, sales by product category, and sales trends over time 2. Create a bar chart to visualize total sales by month	**CO4,5**
8	Mini Project: Create a simple application using all excel concepts.	**CO1 to 5**

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	-	-	-	-	-	-	-	-	2	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Average	3	3	2	-	2	-	-	-	-	-	-	-	3	3

K. K. Wagh Institute of Engineering Education and Research, Nashik
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S.Y.B.Tech. Artificial Intelligence and Data Science **Pattern2023 Semester:IV** **2300211A :Probability & Statistics**		
TeachingScheme:	**CreditScheme:**	**ExaminationScheme:**
Theory :03hrs/week	**03**	**Continuous ComprehensiveEvaluation: 20MarksInSem Exam: 20MarksEndSemExam:60 Marks**

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

COURSECONTENTS

Unit I	**Descriptive measures**	**(09hrs)**	**Cos Mapped CO1, CO2, CO4, CO5**

Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance,StandardDeviation,Range),coefficientsofvariation,Moments,SkewnessandKurtosis.

Unit II	**Random Variable & Distribution functions**	**(9hrs)**	**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**	**(9hrs)**	**Cos Mapped CO1, CO3, CO4, CO5**

Mathematical expectation and Generating function:
MathematicalExpectation,Propertiesofexpectation,Momentgeneratingfunction
Probability distributions: Geometric, Binomial, Poisson, Uniform Distribution, Normal distribution, Standard Normal, Uniform.

Unit IV	**Bivariate Distribution Functions**	**(9hrs)**	**CosMapped 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**	**(9hrs)**	**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,"HigherEngineeringMathematics",KhannaPublication,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**	**COMapped**
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**

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K.K.Wagh Institute of Engineering Education and Research, Nashik
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S. Y. B. Tech. (Artificial Intelligence and Data Science)
Pattern 2023 Semester: IV
2311212: Database Management System

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: - 2311203: Data Structures

Companion Course:- 2311214: Database Management System Lab

Course Objectives:

- To understand the fundamentals of database management System and database query languages
- To know the principles of database design and transaction management
- To study database system architecture and NOSQL databases

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

	Course Outcomes	**Bloom's Level**
CO1	Illustrate applications of databases, and features of RDBMS	2-Understand
CO2	Build database queries using SQL, PL/ SQL and NoSQL queries using MongoDB.	3-Apply
CO3	Construct ER diagram to represent logical design of a database	3-Apply
CO4	Apply different normalization techniques to minimize redundancy and anomalies	3-Apply
CO5	Explain various protocols of transaction management and concurrency control in databases	2-Understand

COURSE CONTENTS

Unit I	**Relational Model and SQL**	**(08 hrs)**	**CO1, CO2**

Introduction: Basic concepts, Advantage of DBMS over file processing system, Data Abstraction, Database Language, Structure of DBMS, Data Modeling, database applications.
RDBMS: Basic concepts, Attributes and Domain, Integrity Constraints.
SQL: Introduction to Relational Algebra and Tuple Relational Calculus, Introduction to SQL, SQL Data types and Literals, DDL, DML, DCL, TCL, SQL Select Query and Clauses.
Topic for Self-Study : Codd's Rules

Unit II	**Advanced SQL and PLSQL**	**(06 hrs)**	**CO2**

SQL Advanced Features: Set Operation, Aggregate Function, Null Values, Nested Sub Query, View, Joins, Sequence, Index, Introduction to Embedded and Dynamic SQL.
Introduction to PL/SQL: Data types, Procedures, Functions, Cursor, Trigger, Package, Assertions, Roles and Privileges.
Topic for Self-Study : Oracle Database Architecture

Unit III	**Database Design: Entity- Relationship Model and Relational Database Design**	**(08 hrs)**	**CO3**

Database Design and ER Model: ER Model, Extended E-R Features, converting ER model and EER model to tables, schema diagrams.
Relational Database Design: Functional Dependency, Normalization 1NF, 2NF and 3NF
Topic for Self-Study : BCNF.

Unit IV	**NO SQL Database**	**(08 hrs)**	**CO4**

Database-system Architecture: Centralized and Client-Server Architecture, Server System Architecture, Introduction to Parallel and Distributed databases.
NoSQL Databases: Structured, Unstructured Data and Semi-Structured Data, Comparison of RDBMS and NoSQL, CAP theorem and BASE property.
Types of NoSQL Databases: Key-value store, document store, graph, wide column stores.
Mongo DB: Data types, CRUD operations, Aggregation, Indexing, Sharding.

Unit V	**Transaction Management**	**(06 hrs)**	**CO5**

Transaction: Transaction concept, Transaction state, Transaction Property, Concurrent Executions
Serializability: Conflict serializability, View Serializability, Testing for Serializability, Deadlock prevention, Deadlock Detection and Recovery from deadlock.
Concurrency Control Protocols: Two phase Locking, Timestamp-based protocol.
Recovery: Failure classification, Shadow-Paging and Log-Based Recovery

Text Books

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", 6 th Edition Tata McGraw Hill Publishers, ISBN 0-07-120413-X.
2. Kristina Chodorow, "MongoDB: The Definitive Guide", 3rd Edition, Oreilly Publications, ISBN 1491954469

Reference Books

3. C J Date, "An Introduction to Database Systems" ,Addison-Wesly, ISBN:0201144719
4. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled", Addisen Wesley publication, ISBN:0201144719

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	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	2	-	2	-	-	-	-	-	-	**2**	2	2
CO3	3	2	3	-	2	-	-	-	-	-	-	2	2	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	2.	-	2	-	-	-	-	-	-	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 3, Unit 4 (Quiz 15 marks each and will be converted to 15 Marks)	15
2	Theory assignment on Unit-5 (One Assignment on Unit 5 of 10 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. Artificial Intelligence and Data Science **Pattern 2023 Semester: IV** **2301212: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**	**(07hrs)**	**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 forWebApps, 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. PankajJalote, "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
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S. Y. B. Tech. Artificial Intelligence and Data Science **Pattern 2023 Semester: IV** **2311214: Object Oriented 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, **2300108A: Programming in C**		

Course Objectives:

- To learn the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism
- To learn how to design and implement generic classes with C++ templates and use exception handling in C++ programs
- To understand object-oriented concepts in Java such as data abstraction, encapsulation, inheritance and polymorphism
- To study the 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	Develop an application using generic programming	3-Apply
CO4	Apply multithreading and exception handling to solve real world problems	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1.	Write a C++ program using inheritance to manage employee data. The program should consist of a base class called Employee that stores common information about employees such as their name, employee ID, and salary. From this base class, derive two classes: Manager having data members department name and number of subordinates and Engineer having data members project name and programming language.	CO1
2.	Write a menu driven program having a class Complex which represents the Complex Number data type. Implement the following 1. Constructor (including a default constructor which creates the complex number 0+0i) 2. Overload operator+ to add two complex numbers	CO1
3.	Write a C++ program to Create a class template to represent generic vectors. Include following functions: To create a vector, To modify the value of given	CO3

	vector, Multiply vector by a scalar value, Display vector	
4.	Write a C++ program to Create a class of employees (data members name, DOB, mobile). Write a function to accept the data and display the information. Use exception handling while accepting the data. e.g in DOB day value should be in between 1 to 31, month value should be in between 1 to 12 etc. Store and retrieve a data from the file.	CO4
5.	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
6.	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
7.	Write a Java program to create calculator for performing arithmetic operations using packages	CO2
8.	Write a Java program that creates two threads to find and print even and odd numbers from 1 to 20.	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: - g++, 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	-	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
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S. Y. B. Tech. (Artificial Intelligence and Data Science) Pattern 2023 Semester: IV 2311215 :Database Management System Lab		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Termwork: 25 Marks Practical Exam : 25 Marks**
Prerequisite Courses: - 2311205: Data Structures Lab		
Companion Course : 2311211 :Database Management System		

Course Objectives:

- To understand the fundamentals of database management System and database query languages
- To know the principles of database design and transaction management
- To study database system architecture and NOSQL databases

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

	Course Outcomes	**Bloom's Level**
CO1	Make use of normalized relational database schemas to represent real-world scenarios	3-Apply
CO2	Build simple and complex SQL queries and PL/ SQL code to retrieve, manipulate relational database	3-Apply
CO3	Construct ER diagram to represent logical design of a database	3-Apply
CO4	Build database queries using MongoDB to retrieve, manipulate NoSQL databases	3-Apply
CO5	Develop database-driven applications using programming languages and frameworks that interact with relational database systems or NoSQL databases	3-Apply

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	**SQL Queries** Consider the given Database Schema: employee (employee-name, street, city) works (employee-name, company-name, salary) company (company-name, city) manages (employee-name, manager-name) Write SQL queries for the following 1. Find the names of all employees who work for First Bank Corporation. 2. Find the names and cities of residence of all employees who work for First Bank Corporation 3. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than Rs.10,000. 4. Find all employees in the database who live in the same cities as the	CO1, CO2

	companies for which they work. 5. Find all employees in the database who live in the same cities and on the same streets as do their managers. 6. Find all employees in the database who do not work for First Bank Corporation. 7. Find all employees in the database who earn more than each employee of Small Bank Corporation. 8. Assume that the companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located. 9. Find all employees who earn more than the average salary of all employees of their company. 10. Find the company that has the most employees. 11. Find the company that has the smallest payroll. 12. Find those companies whose employees earn a higher salary, on average, than the average salary at First Bank Corporation.	
2	**Index, Sequence and View** Consider the given relational table: employee(empno , empname, designation, city, salary, zipcode, county) Write SQL queries for the following 1. Create a sequence used to generate employee numbers for the empno column of the emp table. 2. Create an Index on the county. 3. Find the country whose zipcode = 071 and check whether the query uses the Index and write your observation. 4. Create a view for employees having salary < 50000 and stays in 'Mumbai' 5. Display a Count of employees who stays in 'Mumbai' 6. Find average salary of employees of a created view 7. Display employee names who stays on same street of a view	CO1, CO2
3	**SQL Joins** Consider the given database schema: Student (studentid , studentname,instructorid,studentcity) Instructor(instructorid,Instructorname,instructorcity,specialization) Use all types of Joins 1. Find the instructor of each student. 2. Find the student who is not having any instructor. 3. Find the student who is not having any instructor as well as instructor who is not having student. 4. Find the students whose instructor's specialization is computer. 5. Create a view containing the total number of students whose instructor belongs to "Pune".	CO1, CO2
4	**ER Modelling and Normalization:** Conceptual Design using ER features using tools like ERD plus, ER Win etc. (Identifying entities, relationships between entities, attributes, keys, cardinalities, generalization, specialization etc.) Convert the ER diagram into relational tables and normalize the Relational data model.	CO3
5	**PL/SQL block** Create a database with following schemas Borrower(Rollin, Name, DateofIssue, NameofBook, Status) & Fine(Roll_no,Date,Amt)	CO1, CO2

	1. Write a PL/SQL block to accept input for Borrower table. 2. Write a PL/SQL block using control structures to calculate fine by using the following rules: a. check the number of days (from date of issue), if days are between 15 to 30 then fine amount will be Rs 5 per day b. If no. of days>30, per day fine will be Rs 50 per day c. for days less than 30, Rs. 5 per day. After submitting the book, status will change from I to R. If condition of fine is true, then details will be stored into fine table.	
6	**Cursors** Write a block in PL/SQL to print a report which shows that, the employee id, name, hire date, and the incentive amount they achieved according to their working experiences, who joined in the month of current date. Use explicit cursor	CO1, CO2
7	**Database Trigger** Create a Library database with the schema Books(AccNo, Title, Author, Publisher, Count). a. Create a table Library_Audit with same fields as of Books and Date and status column b. Create a before trigger to insert records into Librry_Audit table if there is deletion in Books table, insert date of deletion and status as deleted Create a after trigger to insert records into Librry_Audit table if there is updation in Books table , insert date of updation and status as updated	CO1, CO2
8	**Database Connectivity**: Write a program to implement Menu driven MySQL/Oracle database connectivity with any front end language for Python/Java/PHP to implement Database navigation operations (add, delete, edit etc.)	CO5
9	**MongoDB Queries** Implement the following MongoDb Query 1. Create a collection named books. 2. Insert 5 records with field TITLE,DESCRIPTION,BY,URL,TAGS AND LIKES 3. Insert 1 more document in collection with additional field of user name and comments. 4. Display all the documents whose title is 'mongodb'. 5. Display all the documents written by 'Ajay' or whose title is 'mongodb'. 6. Display all the documents whose title is 'mongodb' and written by 'Ajay'. 7. Display all the documents whose like is greater than 10. 8. Display all the documents whose like is greater than 100 and whose title is either 'mongodb' or written by 'Ajay'. 9. Update the title of 'mongodb' document to 'mongodb overview' 10. Delete the document titled 'NoSQL overview'. 11. Display exactly two documents written by 'Ajay'. 12. Display the second document published by 'Ajay'. 13. Display all the books in the sorted fashion. Insert a document using the save method.	CO4

10	**MongoDB Aggregation and Indexing** Create the collection Books having the following fields TITLE, DESCRIPTION, BY, URL, TAGS AND LIKES. Implement the following Aggregation and Indexing Queries 1. Find the number of books published by "Ajay" 2. Find books which have minimum likes and maximum likes published by "Ajay". 3. Find the average number of likes of the books published by Ajay. 4. Find the first and last book published by "Ajay".. 5. Create an index on the author name. Display the books published by "Ajay" and check if it uses the index which we have created	CO4
11	**Mini Project:** Form a group of 3 or 4 students and Using the database concepts covered, develop an application with following details: 1. Define a problem statement 2. Follow the Software Development Life cycle and other concepts learnt in Software Engineering Course throughout the implementation. 3. Develop application considering: Front End: Java/Perl/PHP/Python/Ruby/.net/any other language Backend : MongoDB/ MySQL/Oracle 4. Test and validate applications using Manual/Automation testing.	CO1 to 5
Additional Lab Assignments		
1	**ER Modeling** Conceptual Design using ER features using tools like ERD plus, ER Win etc. (Identifying entities, relationships between entities, attributes, keys, cardinalities, generalization, specialization etc.) Convert the ER diagram into relational tables and normalize the Relational data model. ER model of a Hospital management using the following description . Each of these entities have their respective attributes which are Patients - ID(primary key), name, age,visit_date Tests- Name(primary key), date, result Doctor- ID(primary key), name, specialization	CO3
2	**SQL Queries** Consider the following schema account(acc-no,branch-name,balance) depositor(cust-name,acc-no) borrower (cust-name, loan-no) loan (loan - no, branch - name, amount) Write following queries using SQL 1. Create tables using proper primary keys 2. Update information of particular customer 3. Find the customers having loan less than 1 lac 4. Display account number and customer name starting with 'P' 5. Display name of the depositor with balance	CO1, CO2

	6. Find names of all customers who have a loan at the 'Redwood branch'. 7. Find all customers who have an account and loan or both. 8. Find all customers who do not have loan 9. Find average account balance at each branch. 10. Find the name of borrower having maximum loan amount	
3	**PLSQL Block** Write a Stored Procedure namely proc_Grade for the categorization of students. If marks scored by students in examination is <=1500 and marks>=990 then students will be placed in distinction category if marks scored are between 989 and 900 category is first class, if marks 899 n 825 category is Higher Second Class and Less than 825 and > 600 have 'Pass Class'. Insert the result in Result table for all Write a Stored Procedure for calculating Number of students getting each class e.g Distinction - 10 students, First class -5 students. Insert count in the Analysis table Write a PL/SQLblock to use procedures created with the above requirement. Stud_Marks(roll, name, total_marks) Result(Roll,Name, Class) Analysis(class , count)	CO1, CO2
4	Cassandra Queries: Design and Develop Queries using CRUD operations	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)

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	-	-	-	-	-	-	-	-	3	3	2
CO2	2	2	2	-	2	-	-	-	-	-	-	**2**	2	2
CO3	3	2	3	-	2	-	-	-	-	-	-	2	2	-
CO4	2	3	-	-	3	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	3	-	-	-	2	-	-	-	-	-
Average	2.40	2.20	2.25	-	2.5	-	-	-	2	-	-	2.33	2.33	2.00

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

S. Y. B. Tech. Artificial Intelligence and Data Science
Pattern 2023 Semester: IV
2301216: Data Communications 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

Companion Course:-2301216 : Data Communications and Networking

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
(Autonomous from Academic Year 2022-23)

S. Y. B. Tech. Artificial Intelligence and Data Science
Pattern 2023 Semester: IV
2301217 : Data Communication and Computer Network Lab

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

Prerequisite Courses: - FYE221010: Computational Thinking and C Programming, COM222010 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 (Wireless LAN).	CO1

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. Tech Artificial Intelligence &Data Science
Pattern 2023 Semester: III
2301218: Customer Relationship management

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

Prerequisite 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 concept.	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

(Autonomous from Academic Year 2023-24)

S. Y. B. Tech. Artificial Intelligence and Data Science **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 with Nature.

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**	**(05 hrs)**	**COs Mapped - 1**

	fulfilment through All-encompassing Resolution		
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		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignment on Unit 1,2	**30**
2	Group presentations on Unit 3	**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. Artificial Intelligence and Data Science **Pattern 2023 Semester: IV** **2301220: Foreign Language**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical: 02 hrs/week	**01**	**Term Work: 25 Marks** **Practical Exam: 25 Marks**
Prerequisite Courses: -		
Companion Course:-		
Course Objectives: **● To learn language**		