K.D.K. College of Engineering, Nagpur

Scheme and Syllabus for

Bachelor of Computer Application

Submitted by

2025-26

Board of Studies in Computer Application

Vision of the Institute

Service to the Society through Quality Technical Education

Mission of the Institute

M1 Academic excellence in Engineering and Technology through completed dictation to all round growth of young students.

M2 Enable the students to develop into outstanding professionals with technical competence and managerial skills.

M3 Fulfill the expectance of the society and Industry with high ethical standards for developing sustainable solutions.

Vision of the Department

- To emerge as power house of information Technology and Allied are as developing competent computer Professionals to meet the dynamic needs of disruptive technologies.

Mission

- To impart technical knowledge through innovative teaching, research and consultancy.
- Provides state-of-the-art facilities and internationally recognized faculty.
- To adapt to the dynamic needs of industries through curriculum update.
- Promotes partnerships with industry and community.
- To produce competent graduates with professional ethics and life skill

SEMESTER WISE CREDIT DISTRIBUTION:

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Total
I	8	3	2	2	5	-	20
II	12	-	-	2	6	-	20
III	11	-	-	2	4	3	20
IV	15	-	-	-	3	2	20
V	-	-	-	-	6	14	20
VI	-	-	-	-	6	14	20
Total Credits	**46**	**3**	**2**	**6**	**30**	**33**	**120**
			BCA HONOURS				
VII	5	0	3	0	4	8	20
VIII	-	-	-	-	8	12	20
Total Credits	**51**	**3**	**5**	**6**	**42**	**53**	**160**
			BCA (Honors with Research)				
VII	12	-	-	-	-	8	20
VIII	20	-	-	-	-	-	20
Total Credits	**78**	**3**	**2**	**6**	**30**	**41**	**160**

3 Years BCA Program Total Credits = 120

4 Years BCA (Honors) and BCA (Honors with Research): 160

K.D.K College of Engineering, Nagpur											
Department of Computer Application											
Scheme BCA-Second Year (Semester-III)											
Course Code	Course Category	Theory/Practical	Teaching Scheme (Hours/Week)			Examination Scheme					
						Theory				Practical	
			Th	P	Credit	Exam Hrs	CA	MSE	ESE	CA	ESE
3BCC01T	CC	Software Engineering	3	-	3	3	20	30	50	-	-
3BCC01P	CC	Software Engineering Lab	-	2	1	-	-	-	-	25	25
3BCC02T	CC	Object Oriented Programming using C++	3	-	3	3	20	30	50	-	-
3BCC02P	CC	Object Oriented Programming using C++ lab	-	2	1	-	-	-	-	25	25
3BCC03T	CC	Data Security & Privacy	3	-	3	3	20	30	50	-	-
3BSE01T	SEC-I	Introduction to Data Science	3	-	3	3	20	30	50	-	-
3BSE01P	SEC-I	Introduction to Data Science-Lab	-	2	1	-	-	-	-	25	25
3BDS01T	DSE-I	Refer Discipline Specific Basket (Elective-I)	3	-	3	3	20	30	50	-	-
3BVA03P	VAC	Refer VAC Basket	-	4	2	-	-	-	-	50	50
		Total	12	08	20	-	100	150	250	125	125
		Total Marks (Theory& Practical)					500			250	
		Total Marks IIIrd Sem:					750				

K.D.K College of Engineering, Nagpur

Department of Computer Application

Scheme BCA-Second Year (Semester-IV)

Course Code	Course Category	Theory/Practical	Teaching Scheme (Hours/Week)		Credit	Examination Scheme					
						Theory				Practical	
			Th	P		Exam Hrs	CA	MSE	ESE	CA	ESE
4BCC01T	CC	Computer Networks	3	-	3	3	20	30	50	-	-
4BCC01P	CC	Computer Networks Lab.	-	2	1	-	-	-	-	25	25
4BCC02T	CC	Java Programming	3		3	3	20	30	50	-	-
4BCC02P	CC	Java Programming Lab.	-	2	1	-	-	-	-	25	25
4BCC03T	CC	PHP	3	-	3	3	20	30	50	-	-
4BCC03P	CC	PHP Lab.	-	2	1	-	-	-	-	25	25
4BCC04T	CC	Data Warehousing and Data Mining	3	-	3	3	20	30	50	-	-
4BSE02T	SEC-II	Introduction to Machine Learning	3	-	3	3	20	30	50	-	-
4BDS02T	DSE-II	Refer Discipline Specific Basket (Elective-II)	2	-	2	-	10	15	25	-	-
		Total		-	20	-	110	165	275	75	75
		Total Marks (Theory& Practical)					550			150	
		Total Marks IVth Sem:					700				

Discipline Specific Basket
Elective -I

Subject code	Name of Subject
3BDS01T-A	Basics of Electronics Engineering
3BDS01T-B	Design Analysis and Algorithm
3BDS01T-C	Computer Architecture and Organization

Discipline Specific Basket
Elective-II

Subject code	Name of Subject
4BDS02T-A	Mobile Application Development
4BDS02T-B	Business Intelligence
4BDS02T-C	Cloud Computing

VAC Basket

Subject code	Name of Subject
3BVA03P-A	Yoga
3BVA03P-B	Stress Management
3BVA03P-C	Critical Thinking

Exit OPTION

SN	Course Category	Course Code	Name of Course	Teaching Scheme (hrs.)			Total Credit	Examination Scheme					
								Theory				Practical	
				(Th)	TU	P		Exam Hrs.	MSE	CA	ESE	CA	ESE
I	Exit Course	BCAXT01P	8 Week Internship/ Mini Project	-	-	-	4	-	-	-	-	-	200
Total				-	-	4	4	-	-	-	-	-	200
Total Marks(Exit Course)									200				

KDK College of Engineering, Nagpur
Faculty of Science & Technology
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Semester III	**Subject Code:** 3BCC01T	**Name of Subject:** Software Engineering	
Total Hours Distribution per week			
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**

Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

Course Objectives	
1	Knowledge of basic SW engineering methods and practices, and their appropriate application.
2	Describe software engineering layered technology and Process frame work.
3	A general understanding of software process models such as the waterfall and evolutionary models.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Understand to apply knowledge of mathematics, science, and engineering
2	Determine to design and conduct experiments, as well as to analyse and interpret data
3	Understand to function on multi-disciplinary teams
4	Understand Software Engineering Principles
5	Understand project management, and to know software risks and principles of quality management, further the concept of re-engineering and reverse engineering.

Course Competencies

1. Understanding the different phases (requirements, design, implementation, testing, deployment, and maintenance) is essential for managing projects.
2. A fundamental paradigm for structuring and organizing code, including concepts like classes, objects, inheritance, and polymorphism
3. The ability to identify and fix errors in code is vital for software quality. .

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	3	2	-	-	-	3	-	3
CO2	2	1	3	2	3	-	-	-	2	-	2
CO3	2	1	2	2	3	-	-	-	3	-	3
CO4	3	2	3	1	1	-	-	-	3	-	3
CO5	2	1	2	3	2	-	-	-	2	-	2

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit 1: Introduction to Software Engineering		
Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. **A Generic view of process:** Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), process assessment, personal and team process models.	8	CO1
Unit 2: Process models		
Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process. **Software Requirements**: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.	7	CO2
Unit3: Requirements engineering process		
Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. **System models:** Context Models, Behavioural models, Data models, Object models, structured methods.	7	CO3
Unit4: Design Engineering		
Design Engineering: Design process and Design quality, Design concepts, the design model. **Creating an architectural design**: Software architecture, Data design, Architectural styles and patterns, Architectural Design. **Object-Oriented Design**: Objects and object classes, An Object-Oriented design process	7	CO4
Unit5: Risk Management		
Risk Management: Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Software Reliability **Reengineering:** Software reengineering, Reverse Engineering, Restructuring, Forward Engineering	7	CO5

Textbooks

1. Software Engineering, A practitioner's Approach, Roger S. Pressman, McGrawHill International Edition.
2. Software Engineering,Sommerville, Pearson education.
3. Software Engineering principles and practice,Waman S Jawadekar, McGraw-Hill.

References Books

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers 2

			June 2025	1.00	Applicable for AY 2025-26 onwards
Chairman BoS	Dean (Acad.)	Principal	Date of release	Version	

Semester III	SubjectCode: 3BCC01P	Name of Subject: Software Engineering- LAB		
Total Hours Distribution per week				
Total Credit:1	Lecture (L):		Tutorial(T): --	Practical(P):2
Examination Scheme				
Continual Assessment		End Sem Examination	Total Marks	Examination Duration:
25Marks		25Marks	50Marks	-

Course Objective	
Provide students with practical, hands-on experience in applying software engineering principles and methodologies to real-world software development projects.	
Course Outcomes	
After successful completion of this course the students will be able to:	
CO1	Understanding how to gather, analyze, and document software requirements, including functional and non-functional aspects.
CO2	Gaining experience in coding and potentially using specific tools or platforms.
CO3	Learning about the different phases of a software project, including planning, scheduling, and risk management.
CO4	Developing skills in working effectively in teams, communicating technical information, and potentially managing projects.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	-	-	-	3	-	-
CO2	3	3	3	2	3	-	-	-	3	-	-
CO3	3	3	3	2	3	-	-	-	3	-	-
CO4	3	3	3	3	3	-	-	-	3	-	-

List of Practical's
1. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
2. To perform the user's view analysis for the suggested system: Use case diagram
3. To draw the structural view diagram for the system: Class diagram, object diagram.
4. To perform the behavioral view diagram for the suggested system : Sequence diagram
5. To draw the behavioral view diagram : State-chart diagram
6. To draw the behavioral view diagram : Activity diagram
7. To perform the behavioral view diagram for the suggested system: Collaboration diagram.
8. To perform the implementation view diagram: Component diagram for the system.
9. To perform the environmental view diagram: Deployment diagram for the system.
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.

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Semester III	Subject Code: 3BCC02T	Name of Subject: Object Oriented programming (C++)	
Total Hours Distribution per week			
Total Credit:3	Lecture (L):3Hrs	Tutorial(T):	Practical(P):--

Examination Scheme

Mid Sem Examination	Continuous Assessment	End Sem Examination	Total Marks	Examination Duration:
30Marks	20Marks	50Marks	100Marks	3Hours

	Course Objectives
1	Write object-oriented programs using a programming language (e.g., Java, C++, Python).
2	Understand and use abstract classes, interfaces, and exception handling. Learn about object-oriented design principles and patterns.
3	Analyze complex problems and design object-oriented solutions. Evaluate and improve the design and implementation of object-oriented systems. Develop critical thinking and problem-solving skills using OOPS concepts.

	Course Outcomes
	After completion of syllabus, the student is able to
1	To identify classes, objects, members of a class and relationships among them for a specific problem
2	. To do numeric(algebraic) and string –based computation
3	To understand and implement modularity as well as basic error handling techniques
4	To understand and demonstrate the concepts of garbage collection, polymorphism, inheritance etc
5	Illustrate application of pointers in virtual functions.

Course Competencies
1. Understanding how to define classes, which act as blueprints, and how to create objects, which are instances of those classes. .
2. Learning to combine data and methods within a class, controlling access to members using access modifiers (public, private, protected).
3. Understanding how to use functions or methods in different ways depending on the object type, including function/operator overloading and virtual functions.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	3	2	-	-	-	3	1	2
CO2	2	3	3	2	3	-	-	-	2	2	2
CO3	3	2	3	2	2	-	-	-	3	1	2
CO4	2	3	3	3	3	-	-	-	3	2	2
CO5	3	2	2	3	3	-	-	-	2	2	3

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Object Oriented Programming features What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages. C and C++. Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions. **Functions** : Returning values from functions. Reference arguments. Overloaded Function. Inline function. Default arguments. Returning by reference	7	CO1
Unit II: . Object and Classes Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments, returning object from function. Structures and classes.	8	CO2
Unit III: Operator overloading Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable Arrays and string arrays fundamentals. Arrays as class Member Data : Arrays of object, string, The standard C++ String c	7	CO3
Unit IV: Inheritance **Concept of inheritance**. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development.	7	CO4
UnitV: Virtual Functions and Exception handling **Virtual Functions**: Need for Virtual Functions, definition, Pure Virtual Functions, Abstract Classes, Rules for Virtual Functions. **Exception Handling:** Exception Handling Model, List of Exceptions, Handling Uncaught Exceptions, Fault Tolerant Design Techniques, Memory Allocation Failure Exception, Rules for Handling Exception Successfully	7	CO5

Textbooks

1. "The C++ Programming Language" by Bjarne Stroustrup (4th edition)
2. "C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo (5th edition)
3. "Starting Out with C++" by Tony Gaddis (9th edition)

References Books

1. "Head First Object-Oriented Analysis and Design" by Brett McLaughlin, Gary Pollice, and David West
2. "Object-Oriented Programming in C++" by Robert Lafore
3. "Java: A Beginner's Guide" by Herbert Schildt (covers OOPs concepts in Java)

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Semester III	Subject Code: 3BCC02P	Name of Subject: Object Oriented Programming Using 'C++'LAB	
Total Hours Distribution per week			
Total Credit: 1	**Lecture (L):**	**Tutorial(T):**	**Practical(P):2**
Examination Scheme			
Continual Assessment	**End Sem Examination**	**Total Marks**	**Examination Duration:**
25Marks	**25Marks**	**50Marks**	-
Course Objective			
Introduce the core concepts of OOP like abstraction, encapsulation, inheritance, and polymorphism, and to provide hands-on experience in implementing these concepts using the C++ programming language.			
Course Outcomes			
1. Students will be able to differentiate between procedural and object-oriented programming paradigms and explain the core principles of OOP, including abstraction, encapsulation, inheritance, and polymorphism.			
2. Students will develop skills in writing, compiling, and debugging C++ code, including the use of control structures, data types, operators, pointers, arrays, and strings.			
3 Students will be able to design and implement classes and objects to model real-world entities and solve programming problems.			
4 Students will gain experience in file input/output operations using C++ streams.			

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	-	-	-	3	2	2
CO2	3	3	3	2	3	-	-	-	3	2	2
CO3	3	3	3	2	3	-	-	-	3	1	2
CO4	3	3	3	3	3	-	-	-	3	2	2

List of Practical's
1. Write a C++ Program to display the names of header files, definitions and list of functions supported.
2. Write a C++ Program to define constant pointer and pointer to constant and perform possible operations.
3. Write a C++ Program to swap two numbers using call by value, call by address, call by reference and return by reference.
4. Write a C++ Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private).
5. Write a C++ Program to show that "for each object constructors is called separately" and read the values through keyboard (Use Constructor).
6. Write a C++ Program to perform addition, subtraction, multiplication of two objects using operator keyword..
7. Write a C++ Program to derive a class publicly from base class. Declare base class members under public, private and protected.
8. Write a C++ Program to derive single and multiple inheritances.
9. Write a C++ Program to overload unary and binary operator overloading with friend function.
10. Write a CPP Program to define constant pointer and pointer to constant and perform possible operations..

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Semester III	**Subject Code:** 3BCC03T	**Name of Subject:** Data Security & Privacy		
Total Hours Distribution per week				
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

Course Objectives	
1	Learn about the basics of data privacy and security, including data classification, encryption, and access control
2	Understand the role of data privacy and security in an organization's overall information security program
3	Understand the positive and negative impact of technology on privacy, and the ethics of data privacy
4	Learn about the fundamental concepts of data security and privacy mechanisms, including encryption standards and hash functions

Course Outcomes	
After completion of syllabus, the student is able to	
1	To learn the basic concepts related to data security and understand the different types of symmetric key ciphers.
2	To understand and apply the concepts of encryption standards.
3	To understand hash functions and to learn the basic concepts of hiding data in text and images
4	To understand the concepts of privacy, authentication, web and email security.
5	Identify privacy concerns arising from data mining and propose ethical data handling practices.

Course Competencies
1. Developing and implementing data governance policies.
2. Implementing security controls to protect data at rest and in transit.
3. Incorporating privacy principles into system design and development.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	2	3	-	-	1	-	2	3
CO2	2	3	3	1	2	-	-	2	-	2	2
CO3	3	3	3	1	2	-	-	2	-	1	3
CO4	3	2	2	2	3	-	-	2	-	2	2
CO5	2	3	2	1	3	-	-	1	-	1	2

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Introduction to Security and Ciphers		
Introduction: Security goals, Cryptographic Attacks, Services and Mechanism, Techniques. Traditional Symmetric Key Ciphers: Introduction, Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers.	7	CO1
Unit II: . Symmetric and Asymmetric encryption algorithm		
Introduction to Modern Symmetric-Key Ciphers: Modern Block Ciphers, Modern Stream Ciphers. Data Encryption Standard (DES): Introduction, DES Structure, DES Analysis, Multiple DES, Security of DES. Advanced Encryption Standard (AES): Introduction, Transformations, Key Expansion, AES Ciphers, Analysis of AES.	8	CO2
Unit III: Hash Functions, Digital Signature and Data Hiding		
Asymmetric-Key Cryptography: Introduction, RSA Cryptosystem, Rabin Cryptosystem, Elgamal Cryptosystem, Elliptic Curve Crypto systems.Cryptographic Hash Functions: Introduction, Iterated Hash function, SHA-512, WHIRLPOOL. Digital Signature: Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Standard.	7	CO3
Unit IV: Privacy, Legal and Ethical Issues		
Data Hiding in Text: Basic Features, Applications of Data Hiding, Watermarking, Intuitive Methods, BPCS Steganography, Lossless Data Hiding, Spread Spectrum Steganography, Data Hiding by Quantization, Signature Casting in Images, Transform Domain Methods Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy.	7	CO4
Unit V: Security and Ethics in Data-Driven Technologies		
Data Mining, Privacy on the Web, E-Mail Security, Impacts on Emerging Technologies. Legal and Ethical Issues in Computer Security: Protecting Programs and Data, Information and the Law, Rights of Employees and employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security.	7	CO5

Textbooks

1. Cryptography and Network Security by Behrouz A. Forouzan, Dedeep Mukhopadhyay, TMH, 2nd edition, 2013. (Modules I, II, III)
2. Data Privacy and Security by Salomon, David, Springer, 2003. (Module III)
3. Security in Computing by Charles Pfleeger, Shari Lawrence Pfleeger, 5th Edition, PHI,2015. (Module IV)

References Books

1. Information Security: Principles and Practice by Mark Stamp, Wiley Inter Science,2011 Pollice, and David West
2. Computer Security: Art and Science by Matt Bishop, First Edition, Addison Wesley,2002.
3. "Java: A Beginner's Guide" by Herbert Schildt (covers OOPs concepts in Java) Cryptography and Network Security by William Stallings, Pearson Education,7th edition,2017

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Semester III	Subject Code: 3BSE01T	Name of Subject: Introduction to Data Science		
Total Hours Distribution per week				
Total Credit:3	**Lecture (L):3Hrs**		**Tutorial(T):**	**Practical(P):--**
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

Course Objectives	
1	Introduce students to data science fundamentals
2	Develop students' ability to apply data analysis methods to solve real-world problems
3	Enhance students' skills in using data science tools and software
4	To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research

Course Outcomes	
After completion of syllabus, the student is able to	
1	Apply data science concepts and methods to solve problems in real-world contexts
2	Demonstrate proficiency with statistical analysis of data
3	Communicate data science concepts and reasoning in written reports and oral presentations
4	Develop the ability to build and assess data-based models
5	To analyze and apply network using data science

Course Competencies
1. The ability to clearly explain complex data findings to both technical and non-technical audiences is crucial.
2. Data scientists need to be able to identify problems, formulate hypotheses, and design solutions using data analysis techniques.
3. Understanding the business context and applying data insights to solve real-world problems is essential for making an impact.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	3	2	-	-	-	2	2	3
CO2	2	3	2	2	3	-	-	-	3	2	2
CO3	3	2	1	1	3	-	-	-	2	1	3
CO4	2	3	2	3	2	-	-	-	3	2	3
CO5	2	3	2	3	3	-	-	-	3	1	2

Details of Topic	Hours	Mapped with CO
Unit I: Introduction to Data Science		
Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.	7	CO1
Unit II: Data Collection and Data Pre-Processing:		
Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.	8	CO2
Exploratory Data Analytics Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.		
Unit III: Model Development:		
Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.	7	CO3
Unit IV: Model Evaluation:		
Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Over fitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.	7	CO4
Unit V: Regression and Network analysis		
Regression: Linear Regression, Simple Linear Regression, Multiple Unsupervised Learning, Clustering, Similarity and Distances, Quality Measures of Clustering, Network Analysis, Graphs, Social networks, centrality, drawing centrality of Graphs, PageRank	7	CO5

Text Books

1. Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.

References Books

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 201
2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.

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Semester III	Subject Code: 3BSE01P	Name of Subject: INTRODUCTION DATA SCIENCE- LAB	
Total Hours Distribution per week			
Total Credit:1	**Lecture (L):**	**Tutorial(T): --**	**Practical(P):2**
Examination Scheme			
Continual Assessment	**End Sem Examination**	**Total Marks**	**Examination Duration:**
25Marks	**25Marks**	**50Marks**	-

Course Objective
Equip individuals with the skills to extract meaningful insights from data, enabling them to solve complex problems and drive informed decision-making in various fields.

Course Outcomes	
After successful completion of this course the students will be able to:	
CO1	Students will be able to write code in languages like Python or R to manipulate, analyze, and visualize data
CO2	Apply statistical methods for data exploration, inference, and modeling.
CO3	Evaluate various data models, including machine learning models.
CO4	Create effective visualizations to communicate insights from data.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	1	3	3	-	-	-	3	2	-
CO2	3	3	2	1	3	-	-	-	3	2	-
CO3	3	3	1	1	3	-	-	-	3	1	-
CO4	3	3	2	3	3	-	-	-	3	2	-

List of Practical's
1. Working with Numpy arrays
2. Working with Pandas data frames
3. Develop python program for Basic plots using Matplotlib
4. Develop python program for Frequency distributions
5 . Develop python program for Variability
6. Develop python program for Averages
7. Develop python program for Normal Curves
8. Develop python program for Correlation and scatter plots
9. Develop python program for Correlation coefficient
10.Develop python program for Simple Linear Regression

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KDK College of Engineering, Nagpur
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Bachelor of Computer Application

Semester III	Subject Code: 3BDS01T-A	Name of Subject: Basics of Electronics Engineering (Professional Elective – 1)		
Total Hours Distribution per week				
Total Credit: 3	**Lecture (L): 3 Hrs**		**Tutorial (T) :**	**Practical (P): --**
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30 Marks	**20 Marks**	**50 Marks**	**100 Marks**	**3 Hours**

Course Objectives	
1	To understand different components and devices of digital electronics.
2	To gain fundamental knowledge of electronic components and shall be able to draw logic circuits.
3	To Design & develop combinational circuits.
4	To Design & develop sequential circuits.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Solve number system problems & analyze the concept of digital logic gates.
2	Analyze, Design & implement combinational circuits.
3	Analyze, Design & implement sequential circuits.
4	Understand the basic principles of communication systems.
5	Demonstrate the concepts of wireless network and 4G Technology

Course Competencies
Understanding fundamental electrical concepts: Voltage, current, resistance, power, and energy.
Identifying and characterizing basic electronic components: Resistors, capacitors, inductors, diodes, transistors, and integrated circuits.
Understanding the basics of digital electronics: Logic gates and simple digital circuits.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	3	2	-	1	-	-	-	-	2	2
CO2	3	2	3	-	1	-	-	-	-	2	1
CO3	2	3	3	-	1	-	-	-	-	1	2
CO4	3	3	2	-	1	-	-	-	-	2	1
CO5	3	2	3	-	1	-	-	-	-	1	1

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Number System and Digital Logic	7	CO1
Number System: Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Representation of Signed Numbers & Binary Arithmetic		
Binary Codes: 8421 BCD Code, XS-3 Code, Gray Code		
Logic gates: AND, OR, NOT, Universal gates, EX-OR & EX-NOR gates,		
Boolean Algebra: Axioms & laws of Boolean Algebra, Demorgan's Theorem, Expansion of a Boolean expression, Conversion between canonical forms(SOP to POS & vice versa),		
Unit II : Combinational Circuits	8	CO2
K-map: Minimization of Switching function(K-map up to four variable)		
Combinational Circuits: Adder (half adder & full adder), Subtractor (half subtractor & full subtractor)		
Code Converter: Binary-to-Gray, Gray-to-Binary, Binary-to-BCD, BCD-to-XS-3, BCD-to-Gray		
Encoder: Octal-to-Binary, Decimal-to-BCD, 4-Input Priority Encoder		
Decoder: 3-Line-to-8-Line, BCD-to-Decimal		
Unit III : Sequential Circuits	7	CO3
Multiplexer: 2 and 4 Input, **Demultiplexer:**1-Line to 4-Line, 1-Line to 8-Line		
Sequential Circuits: Classification of sequential circuits, Latches and Flip-Flops		
Flip–Flops: S-R, J-K, D, T		
Counters: Asynchronous and Synchronous counters		
Importance of Electronics in Computer Science and Engineering, Voltage, Current, and Resistance, Passive Components (Resistors, Capacitors, Inductors)		
Unit IV : Introduction to Communication Systems	7	CO4
Introduction to Communication Systems		
Analog and Digital Communication, Serial and Parallel Communication		
Wireless Communication, Wireless Network Topologies		
Unit V: Networking Basics	7	CO5
Networking Basics, Building Simple Communication Systems, Cellular Wireless Networks - Introduction, Cellular system, cellular concept and frequency reuse.		
Wireless Network Topologies – Fourth Generation (4G) Technology and introduction to 5G		

Text Books

1. A Textbook of Applied Electronics, R S Sedha, S Chand and company
2. Text Books: "Electronics Devices" by Thomas. L. Floyd, 9th Edition, Pearson
3. Fundamentals of Digital Circuits, by Anand Kumar.

References Books

1. S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", Tata McGraw Hill
2. Modern Digital Electronics" by R.P. Jain, 4th Edition, Tata McGraw Hill
3. Electronic Communication Systems" by Kennedy & Davis, 4th Edition, Tata McGraw Hill

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KDK College of Engineering, Nagpur
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Semester III	**Subject Code: 3BDS01T-C**	**Name of Subject** Computer Architecture & Organization (Professional Elective – I)		
Total Hours Distribution per week				
Total Credit: 3	**Lecture (L): -3**	**Tutorial (T):**	**Practical (P):**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30 Marks	**20 Marks**	**50 Marks**	**100 Marks**	**3 Hours**

Course Objectives	
1	To understand basic functional structure of computers and data representation on it
2	To gain fundamental knowledge of basic processing units and shall be able to draw instruction formats.
3	To solve arithmetic algorithms and problems.
4	To understand the concept of memory & I/O operations and devices.
5	To acquire basic knowledge about I/O Organization & Pipelining.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Recognize basic functional blocks of computer and addressing modes.
2	Differentiate data in different instruction formats & design the concept of bus organization & Control Unit.
3	Solve arithmetic problems, Booths Algorithms and IEEE standard numerical.
4	Categorize data in different mapping functions & solve memory related problems.
5	Define how data from main memory is mapped to cache.

Course Competencies
1.Understanding the basic structure and components of a computer
2.Understanding different instruction formats, addressing modes, and how they affect processor design and performance.
3. Covers different memory technologies (RAM, ROM, cache), their characteristics, and how they contribute to system performance.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1	-	2	-	-	-	2	2	2
CO2	2	3	2	-	3	-	-	-	2	2	1
CO3	3	3	1	-	2	-	-	-	2	1	2
CO4	3	3	1	-	3	-	-	-	2	2	2
CO5	2	2	1	-	2	-	-	-	2	1	1

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Basic Structure of Computers & Machine Instructions	7	CO1
Basic functional blocks of a computer: Computer Types, Functional Units, Basic operational concepts, Bus structures, Multiprocessors and Multi-computers		
Machine Instructions: Memory Locations and addresses, Memory Operations, Instruction and Instruction Sequencing, addressing modes, Stack and queues.		
Unit II:Instruction Formats & Basic Processing Unit	7	CO2
Instruction Formats: Three address Instruction, Two address instruction, One address instruction, Zero address instruction		
Some Fundamental concepts: Single bus organization, Execution of complete Instruction, Multiple bus organization,		
Control Units: Hardwired Control, Microprogrammed Control		
Unit III: Arithmetic	8	CO3
Data representation: Number representation, Modular number system and 2's complement system, Overflow in integer arithmetic, Multiplication of Positive Numbers, Signed Operand Multiplication (Booth Algorithm), Fast Multiplication, Integer Division - non-restoring and restoring techniques, IEEE standard for floating point numbers.		
Unit IV: Memory System	7	CO4
Memory Basic Concepts: Semiconductor RAM memories, Internal organization of memory chips, Static Memories, DRAM		
Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash memory		
Unit V: Peripheral devices and subroutine	7	CO5
Cache Memories: Mapping functions, Replacement algorithms, write policy		
Memory interleaving, Memory hierarchy, Virtual Memories, Address Translation **Peripheral Devices:** Accessing I/O Devices,		
Subroutine: Subroutine Nesting , Parameter Passing		

Text Books

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky Computer Organization, McGraw Hill Education
2. Computer Organization and Architecture Seventh Edition, William Stallings, PHI 2010
3. Computer Architecture & Organization III Edition, J.P Hayes

References Books

1. M. Mano, "Computer System and Architecture", PHI, 1993
2. Computer Organization, Design and Architecture (IV Edition), Sajjan G. Shiva, CRC Press.
3. Computer Organization and Design, 4th Ed, D. A. Patterson and J. L. Hennessy

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Semester III	Subject Code: 3BDS01T-B	Name of Subject: Design Analysis and Algorithm (Professional Elective – I)	
Total Hours Distribution per week			
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial (T) :**	**Practical (P): --**
Examination Scheme			

Mid Sem Examination	Continuous Assessment	End Sem Examination	Total Marks	Examination Duration:
30 Marks	20 Marks	50 Marks	100 Marks	3 Hours

Course Objectives	
1	Ability to analyze the performance of algorithms in terms of their time and space complexities.
2	Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design)
3	To understand the different algorithm designing technique for solving problems.
4	Assess how the choice of data structures and algorithm design methods impacts the performance of programs
5	Solve problems using algorithm design strategies like the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound etc.

Course Outcomes	
After completion of syllabus, the student is able to	
1	At the end of the course students will be able to develop their own versions for a given computational task and to compare and contrast their performance with respect to time and space
2	The ability to choose the best possible model from a set of different algorithms and data structures so as to minimize the overall cost incurred.
3	Understand the fundamentals of algorithm design, including problem specification and analysis of time and space complexity.
4	Apply the Greedy approach to solve optimization problems such as Dijkstra's Algorithm, Knapsack Problem, and Minimum Cost Spanning Trees.
5	Recall and Classify the NP -hard and NP-complete problems

Course Competencies
1. Understanding and applying concepts like time and space complexity, Big O notation, and asymptotic analysis to evaluate algorithm efficiency.
2. Proficiency in various algorithm design paradigms like divide and conquer, greedy algorithms, dynamic programming, and backtracking.
3. Ability to prove the correctness of algorithms using techniques like induction and invariants.

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	3	1	1	-	-	-	-	-	2	3
CO2	3	2	2	2	-	-	-	-	-	2	2
CO3	3	2	1	1	-	-	-	-	-	1	2
CO4	3	3	1	2	-	-	-	-	-	2	3
CO5	2	3	2	1	-	-	-	-	-	1	2

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I : Introduction		
Introduction: Algorithm Specification-Simple example of design and analysis of time complexity-Performance Analysis: Space Complexity and Time complexity, Asymptotic Notation - Polynomial Vs Exponential Algorithms. Solutions of recurrence relations using technique of characteristic equation and generating functions, Complexity calculation of various standard functions.	7	CO1
Unit II: Divide and Conquer algorithm		
Divide and Conquer algorithm: Introduction to Divide and Conquer Algorithms - Master Theorem – Sorting - Insertion Sort, Merge Sort using links, Quick Sort- Analysis of linear and binary search algorithm. Horner's method of evaluation a polynomial at a given point, Strassen' Matrix Multiplication.	8	CO2
Unit III: Dynamic programming		
Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortised analysis, application of amoterized analysis **Dynamic programming:** Design and analysis, Computing a Binomial Coefficient, Multistage graphs, Traveling salesman problem.	7	CO3
Unit IV: Back tracking		
Greedy approach: General method, Dijkstra's Algorithm, Knapsack problem, Minimum cost Spanning trees, Single source shortest path problem. **Back tracking:** General method - Sum of subsets - 4-Queen Problem using backtracking. Branch and Bound method- 4-queens - Least Cost Search, Traveling Salesman problem using Branch and Bound method.	7	CO4
Unit V: Computational Complexity and NP-Completeness		
Limitations of Algorithm- Introduction to lower bound theory, Decision trees, Introduction to P, NP and NP complete problems, NP hard problems. NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NPhard and NP-complete, Cook's theorem, decision and optimization problems, graph based problems on NP Principle.	7	CO5

Text Books

1. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. V. Gelder Pearson Education.
2. Ellis Horowitz, SartajSahniSanguthevarRajasekaran, Fundamentals of Computer Algorithms. Universities Press (India) Private Limited. Second edition.
3. Donald E. Knuth. The art of Computer Programming,Volume 1: Fundamental Algorithms.Addison Wesley.

References Books

1. AnanyLevitin, Introduction to the design and Analysis of Algorithms. Dorling Kindersley (India) Pvt.Ltd. Second edition
2. Gav PAI, Data Structures and Algorithms, Tata McGraw Hill, Jan 2008.

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Semester III	Subject Code: 3BVA03P-A	Name of Subject: Yoga	
Total Hours Distribution per week			
Total Credit: 2	Lecture (L): -Hrs	Tutorial (T) :	Practical (P): --4

Examination Scheme

Mid Sem Examination	Continuous Assessment	End Sem Examination Practical	Total Marks	Examination Duration:
-	50 Marks	50 Marks	100 Marks	-

Course Objectives	
1	Students will have an understanding about origin, history and development of Yoga..
2	They will have an idea about the insights of Indian philosophy and Astika & Nastika darshanas.
3	Introduction about Yoga according to various yogic texts.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Increased flexibility, improved strength and balance, enhanced body awareness.
2	Development of mindfulness, reduced stress, improved concentration, and emotional resilience.
3	Understanding of yoga philosophy and its relevance to modern life, and potentially, the pursuit of self-realization and spiritual enlightenment.
4	Understand the origin and development of Yoga through Yogopanishads

Course Competencies
1.A strong understanding and ability to perform a wide range of yoga postures, including modifications for different body types and skill levels.
2.Knowledge of various breathing exercises and their effects on the body and mind.
3. Developing and maintaining flexibility, strength, and overall fitness for a safe and effective yoga practice

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	1	-	2
CO2	-	-	-	-	-	-	-	-	2	-	3
CO3	-	-	-	-	-	-	-	-	3	-	2
CO4	-	-	-	-	-	-	-	-	2	-	

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: General introduction to yoga Unit-1: General introduction to yoga Brief about origin of Yoga: Psychological aspects and Mythological concepts; History and Development of Yoga: prior to the Vedic period, Vedic period, Medival period, modern era; Etymology and Definitions of Yoga.	6	CO1
Unit II : Introduction to Indian philosophy Unit - 2: General introduction to Indian philosophy Philosophy: meaning, definitions and scope; Indian Philosophy: Salient features, Branches (Astika and Nastika Darshanas).	6	CO2
Unit III : Yoga and religion Distinction from Religion and Science, Brief introduction to Prasthanatrayee and Purushartha Chatushtaya; Relationship between Yoga and Indian Philosophy Brief about Yoga in texts –Brief to Upanishads and Yoga in Principal Upanishads.	6	CO3
Unit IV: Brief about Yoga Yoga in Yogopanishad; Yogic perspective of Epics: Ramayana, Adhyatma Ramayana and Mahabharata; Yogic perspective: Bhagavad Gita, Yoga Vasishtha, Narada Bhakti Sutras.	6	CO4

Text Books

1. Lal Basant Kumar : Contemporary Indian Philosophy, Motilal Banarsidas Publishers Pvt. Ltd, Delhi, 2013
2. Dasgupta S. N : History of Indian Philosophy, Motilal Banarsidas, Delhi, 2012
3. . Singh S. P : History of Yoga, PHISPC, Centre for Studies in Civilization Ist, 2010

References Books

Agarwal M M: Six systems of Indian Philosophy, Chowkhambha Vidya Bhawan, varanai, 2010

1. Swami Bhuteshananda: Nararad Bhakti Sutra, Advaita Ashrama Publication-Dept. Kolkata, II Edition, 2009
2. Hiriyanna M: Outlines of Indian Philosophy, Motilal Banarsidas, Delhi, 2009

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Semester III	Subject Code: 3BVA03P-B	Name of Subject: Stress Management		
Total Hours Distribution per week				
Total Credit: 2	**Lecture (L): -Hrs**	**Tutorial (T) :**	**Practical (P): --4**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination Practical**	**Total Marks**	**Examination Duration:**
-	50 Marks	50 Marks	100 Marks	-

Course Objectives	
1	To understand the nature and consequences of stress
2	To understand the impact of stress on work
3	To recognize the stressors, Adaptive and Maladaptive behavior.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Understand the cognitive variables of stress
2	Learn Managing Work-Life Balance
3	Understand role of communication and emotional intelligence, conflict management
4	Preparing for better future by reducing the stress using the various techniques

Course Competencies
1. Understand the concept of stress and its impact on mental, emotional, and physical health.
2. Identify personal stressors and analyze their sources in academic, social, and personal life.
3 Apply practical stress reduction strategies, such as mindfulness, meditation, yoga, and breathing exercises.

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	2	-	2
CO2	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	3	-	2
Co4	-	-	-	-	-	-	-	-	2	-	3

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Meaning and nature of stress:		
Meaning and nature of stress: Difference between eustress and distress; Frustration, conflict and pressure; Meaning of stressors; Sources of stress (i) Psychological, Social, Environmental (ii) Academic, Family and Work stress common stressors at work place: Stressors unique to age and gender, stress Response- 'Fight or Flight' Response, Stress warning signals	6	CO1
Unit II: Cognitive appraisal of stress:		
Cognitive appraisal of stress: General adaptation to stress; Consequences of stress; Physiological and psychological changes associated with the stress response. Stress and Memory; Stress and Other Cognitive Variables; Stressful environmental conditions on performance	6	CO2
Unit III : Stress and Work performance:		
Stress and Work performance: Role of communication in managing stress and work performance: Emotional regulation and coping; Emotional intelligence and conflict management: Emotional Basis and Stress; Stress and Conflict in Relationships.	6	CO3
Unit IV Strategies of Stress Management and Preparing for future		
Copping Mechanisms- Coping Mechanisms: Appraisal focused, Emotional focused and Problem focused, Stress warning signals Care of the Self: Nutrition and Other Lifestyle Issues Stress reduction practices: Time management; Exercise; Relaxation techniques; yoga; meditation.	6	CO4

Text Books

1. Baron .L & Feist.J (2000) Health Psychology 4th edition, USA Brooks/Cole
2. Barlow, Rapee, and Perini(2014), 10 Steps to Mastering Stress: A Lifestyle Approach, USA
3. Clayton,M, (2011).Brilliant stress management How to manage stress in any situation's 1st edition, Greart Britain Pearson Education

References Books

4. Cooper,C,& Palmer,S, (2000)Conquer Your Stress, London: Institute of personal development Universities Press.

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Semester III	Subject Code: 3BVA03P-C	Name of Subject: Critical Thinking		
Total Hours Distribution per week				
Total Credit: 2	Lecture (L): -Hrs	Tutorial (T) :	Practical (P): --4	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination Practical**	**Total Marks**	**Examination Duration:**
-	50 Marks	50 Marks	100 Marks	-

Course Objectives	
1	Understand and apply fundamental principles of logical reasoning and argumentation.
2	Identify, analyze, and evaluate arguments and evidence in engineering contexts.
3	Develop problem-solving strategies using critical thinking methodologies.
4	Apply critical thinking skills to real-world engineering problems and case studies.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Demonstrate the ability to construct and deconstruct arguments effectively.
2	Apply logical reasoning to identify and solve engineering problems.
3	Evaluate the credibility of sources and the validity of information in engineering scenarios.
4	Make informed decisions by integrating critical thinking with technical knowledge.

Course Competencies
1) Understand the principles of critical thinking, including logic, reasoning, argumentation, and problem-solving.
2) Apply analytical thinking to assess complex problems and make well-informed decisions.
3) Demonstrate critical thinking skills in academic, personal, and professional contexts

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	3	-	3

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Foundations of Critical Thinking **Foundations of Critical Thinking:** Introduction to critical thinking and its importance in engineering, Elements of reasoning: purpose, question, information, interpretation, concepts, assumptions, implications, and point of view, Common logical fallacies and cognitive biases.	6	CO1
Unit II: Logical Reasoning and Problem Solving **Logical Reasoning and Problem Solving:** Deductive and inductive reasoning, Problem-solving frameworks: means-end analysis, root cause analysis, Decision-making models in engineering.	6	CO2
Unit III: Critical Analysis in Engineering Contexts **Critical Analysis in Engineering Contexts:** Evaluating technical reports and data, Assessing risk and uncertainty in engineering decisions, Ethical considerations and their impact on engineering solutions.	6	CO3
Unit IV: Application of Critical Thinking in Engineering Projects Integrating critical thinking in the engineering design process, Collaborative problem-solving and communication, Reflective practices for continuous improvement.	6	CO4

Text Books

1) Critical Thinking: A Student's Introduction, Gregory Bassham, William Irwin, Henry Nardone, James Wallace, Publisher: McGraw-Hill Education

2)Thinking Skills: Critical Thinking and Problem Solving by John Butterworth, Geoff Thwaites, Publisher: Cambridge University Press

References Book

3) Critical Thinking and Communication: The Use of Reason in Argument by Edward S. Inch, Barbara Warnick, Publisher: Pearson.

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IV Semester
Syllabus

KDK College of Engineering, Nagpur
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Semester IV	Subject Code: 4BCC01T	Name of Subject: COMPUTER NETWORKS		
Total Hours Distribution per week				
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

Course Objectives	
1	To introduce the fundamental types of computer networks.
2	To demonstrate the TCP/IP & OSI model merits & demerits.
3	To know the role of various protocols in Networking
4	To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.

Course Outcomes	
After completion of syllabus, the student is able to	
1	Students should be understand and explore the basics of Computer Networks and Various Protocols.
2	Student will be in a position to understand the World Wide Web concepts.
3	Students will be in a position to administrate a network and flow of information further.
4	Student can understand easily the concepts of network security, Mobile.
5	Student can understand the concept of Application Layer.

Course Competencies
1. Understanding basic networking concepts, including network topologies, types of networks (LAN, WAN, etc.), and the OSI or TCP/IP model.
2. Knowledge of essential protocols like TCP/IP, DNS, DHCP, and others used in communication.
3. Understanding security principles, threats, and technologies like firewalls, intrusion detection systems, and encryption.

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	-	-	2	-	-	-	3	3	2
CO2	3	2	-	-	3	-	-	-	2	2	3
CO3	2	3	-	-	2	-	-	-	3	3	2
CO4	3	2	-	-	3	-	-	-	2	2	2
CO5	3	2	-	-	3	-	-	-	3	2	3

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Introduction: Introduction: Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, Comparison of the OSI and TCP/IP reference model. Architecture of Internet. Physical Layer: Guided transmission media, Wireless transmission media, Switching.	7	CO1
Unit II: Data Link Layer: Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, Sliding window protocols Multiple Access Protocols - ALOHA, CSMA,CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.	7	CO2
Unit III: Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, IP addresses, CIDR, Subnetting, SuperNetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP, RARP	8	CO3
Unit IV: Transport Layer: Services provided to the upper layers elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery.The Internet Transport Protocols: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm.	7	CO4
Unit V: Application Layer Application Layer- Introduction, providing services, Applications layer paradigms: Client server model, HTTP, E-mail, WWW, TELNET, DNS; RSA algorithm,. Application Layer Protocol Design	7	CO5

Text Books

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education,
2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Educatio

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Semester IV	SubjectCode: 4BCC01P	Name of Subject: COMPUTER NETWORKS- LAB	
Total Hours Distribution per week			
Total Credit:1	Lecture (L):	Tutorial(T):	Practical(P):2
Examination Scheme			
Continual Assessment	End Sem Examination	Total Marks	Examination Duration:
25Marks	25Marks	50Marks	-

Course Objective
ability to analyze network requirements, understand layered architectures, apply routing and switching techniques, and grasp network security concepts

Course Outcomes	
After successful completion of this course the students will be able to:	
CO1	Identify and use various networking components like routers, switches, and cables, and understand different transmission media.
CO2	They will be able to implement different network topologies using network devices.
CO3	Students will gain a practical understanding of the layered architecture of network protocols (like TCP/IP) and the role of each layer.
CO4	Students will learn to configure network devices and protocols (e.g., TCP/IP) on both Windows and Linux systems.

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	3	-	-	-	3	2	-
CO2	3	3	-	-	3	-	-	-	3	2	-
CO3	3	3	-	-	3	-	-	-	3	2	-
CO4	3	3	-	-	3	-	-	-	3	2	-

List of Practical's
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3 Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5 Implement distance vector routing algorithm for obtaining routing tables at each node.
6. Implement data encryption and data decryption
7 Write a program for congestion control using Leaky bucket algorithm.
8. Write a program for frame sorting technique used in buffers.
9. Operating System Detection using Nmap
10. Take an example subnet of hosts and obtain a broadcast tree for the subnet.

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Semester IV	Subject Code: 4BCC02T	Name of Subject: JAVA PROGRAMMING		
Total Hours Distribution per week				
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

	Course Objectives
1	To introduce the object-oriented programming concept
2	To understand object-oriented programming concepts, and apply them in solving problems
3	To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
4	To introduce the concepts of exception handling and multithreading.
5	To introduce the design of Graphical User Interface using applets and swing controls.

	Course Outcomes
After completion of syllabus, the student is able to	
1	Use the syntax and semantics of java programming language and basic concepts of OOP.
2	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4	Design event driven GUI and web related applications which mimic the real word scenarios.
5	Describe the need for exception handling in programming.

Course Competencies
1. Understanding classes, objects, inheritance, polymorphism, and encapsulation.
2. Working with arrays, lists, trees, graphs, and implementing sorting and searching algorithms.
3. Understanding variables, data types, operators, and the Java language structure. .

CO-PO Articulating Matrix :

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	-	2	-	-	-	-	-	2
CO2	2	3	3	-	3	-	-	-	-	-	1
CO3	3	3	2	-	2	-	-	-	-	-	2
CO4	3	2	2	-	3	-	-	-	-	-	2
CO5	2	3	3	-	3	-	-	-	-	-	1

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Introduction to Java and Object-Oriented Programming **JAVA**,Concept of class , Introduction of Object Oriented Programming concept ,Features of JAVA **Basic concepts of OOPs:** Object, Class, Inheritance, Polymorphism, Abstraction, Encapsulation , Introduction to class diagram(UML diagram) , Structure of JAVA Program Creating a JAVA source file , Compiling of JAVA source file and Compilation process. Using Data with JAVA programs ,Constants, Literals, Variables, Keywords, Identifier ,Data types(Integers, Floating Point, Character, Boolean) Operators(Arithmetic, Relational, Boolean, Increment and decrement, conditional, Bitwise)	8	CO1
Unit II: Conditional statements ,Array and string **Control Statements** : Flow Control Statements(If and if …. else , Nesting IF … else , Switch case statement) , Looping Statement(While loop, for loop, do..while loop, Nested Loop) **Array and String in JAVA**: Declaring and initializing an array , Using two dimensional and multidimensional arrays , Passing arrays to methods , methods of arrays fill(), sort(), equal(),binary search() **String methods :** Initialization of string , Manipulating string class (isUppercase(), toUppercase(),isLowercase(), toLowercase())	7	CO2
Unit III:Classes **Methods , Classes and Objects** :- Class variables and class methods , Classification of variable declared in a class(local variable, Instance variable, Class variable) , Method Overloading , Constructors , Visibility modifiers for Access control(Public, Private , Protected) , Passing object as a parameter in a method , Inheritance , Super class , Final method, Static method , Abstract class.	7	CO3
Unit IV: Multithreaded Programming and Package, Interface Use of Multithread programming, Thread class and Runnable interface , Thread priority, Thread synchronization, Thread communication, Deadlock Use of Package, CLASSPATH, Import statement, Static import, Access control , Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch , Comparison between Abstract Class and interface	7	CO4
Unit-V: Exception Handling Learning about exceptions , Limitations of traditional error handling , Types of JAVA Exceptions(Checked exception, Unchecked exception, error) , Java Try and catch block , Java Multiple catch Block , Java Finally Block , Java Throw block , Java throws block , Java Custom exceptions , Advantages of Exception Handling	7	CO5

Text Books

1. Java Programming for the absolute beginner, PHI, Joseph P. Russel (Text book).
2. JAVA Programming , Publication: Pearson By HAri Mohan Pandey

REFERENCE BOOKS:

1. . E. Balagurusamy, Programming with Java – A Premier, McGraw-Hill. Understanding
2. Mike Megrath, Java in Easy Steps, McGraw-Hill.

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Semester IV	SubjectCode:4 4BCC02P	Name of Subject: JAVA PROGRAMING -LAB		
Total Hours Distribution per week				
Total Credit:1	Lecture (L):		Tutorial(T):	Practical(P):2
Examination Scheme				
Continual Assessment		End Sem Examination	Total Marks	Examination Duration:
25Marks		25Marks	50Marks	-

Course Objective
To design and program stand-alone Java applications. To learn how to design a graphical user interface (GUI) with Java Swing.

Course Outcomes	
After successful completion of this course the students will be able to:	
CO1	Apply Basic Programming concepts such as type casting, control structures and looping statements to execute a given program.
CO2	Implement abstraction and package concepts for the given scenario.
CO3	Apply object-oriented concepts like encapsulation, polymorphism and inheritance to solve the given problem.
CO4	Develop applications that use collections and exceptions for the given requirements.

CO-PO Articulating Matrix:

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	-	3	-	-	-	-	-	-
CO2	3	3	3	-	3	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	-	-	-
CO4	3	3	3	-	3	-	-	-	-	-	-

List of Practical's
1. Write an algorithm, draw a flowchart and develop a Java program to accept a number from the user and print its factorial.
2. Write an algorithm, draw a flowchart and develop a Java program to accept three numbers from the user and print the largest number.
3 .Write an algorithm, draw a flowchart and develop a Java program to print first 10 prime numbers.

4. Write an algorithm, draw a flowchart and develop a Java program to print the following designs
`*      1        1        1`
`**     1 2      2 2      2 2`
`***    1 2 3    3 3 3    3 3 3`
`****   1 2 3 4  2 2      4 4 4 4`

5 .Write an algorithm, draw a flowchart and develop a Java program to accept any 10 numbers from the user to store it in an Array and print the largest of all
6. Write an algorithm, draw a flowchart and develop a Java program to multiply two matrices by accepting matrix elements from the user.
7. Write an algorithm, draw a flowchart and develop a Java program to accept 10 names from the user to store them in array of string and print them in Alphabetical order.
8. Write an algorithm, draw a flowchart and develop a Java program to demonstrate multilevel inheritance..
9. Write an algorithm, draw a flowchart and develop a Java program to demonstrate object references.
10. Write an algorithm, draw a flowchart and develop a Java program to accept any digit number from the user and print its reverse.

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Semester IV	Subject Code: 4BCC03T	Name of Subject: PHP		
Total Hours Distribution per week				
Total Credit:3	Lecture (L):3Hrs	Tutorial(T):	Practical(P):--	
Examination Scheme				
Mid Sem Examination	Continuous Assessment	End Sem Examination	Total Marks	Examination Duration:
30Marks	20Marks	50Marks	100Marks	3Hours

	Course Objectives
1	To introduce the importance of PHP in web page design
2	To understand the features like functions, forms in PHP.
3	To understand Files, OOPs concepts , Cookies, Sessions and Data base
4	To handle requests and draw images on the server with AJAX.

	Course Outcomes
	After completion of syllabus, the student is able to
1	Utilizing the basic concept of statements and arrays
2	Implement functions and browser handling power of PHP
3	Imparting Database applications, File handling, Cookies in the webpage.
4	Design and Implement Interactive Web Site using Forms, OOPS and AJAX.
5	Understand the fundamentals of AJAX and its role in asynchronous web communication.

Course Competencies
1. Understanding the benefits of using PHP frameworks like Laravel, Symfony, or CodeIgniter.
2. If a specific framework is taught, understanding its structure, routing, and templating system.
3. Understanding variables, data types, operators, and the Java language structure. .

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	1	2	-	-	-	3	-	3
CO2	2	3	3	1	3	-	-	-	2	-	2
CO3	3	3	2	2	2	-	-	-	3	-	3
CO4	3	2	3	1	3	-	-	-	3	-	3
CO5	2	3	2	2	3	-	-	-	2	-	2

Syllabus

Details of Topic	Hours	Mapped with CO
Unit I: Introduction: Essential PHP – Operators and Flow control: Working with math, assignment, increment and decrement, string, bitwise, execution, comparison and logical operators, Working with loops – Strings and Arrays.	7	CO1
Unit II: PHP Functions and Browser handling power:: Creating Functions, passing functions, passing arrays, pass by reference, default arguments, returning data, arrays, lists, references, accessing global data, working with static variables, PHP conditional functions, variable functions, nesting functions – Reading data in web pages: Handling text fields, areas, check boxes, radio buttons, list boxes, password controls, hidden controls, image maps, file uploads, buttons – PHP Browser handling power.	8	CO2
Unit III: Working with Object oriented programming and File handling: Object oriented programming: creating classes, objects, setting access to properties and methods, using constructors and destructors, inheritance, overriding and overloading methods, auto loading classes – File Handling: open, read, close, parsing files, copy, delete, write and append files.	7	CO3
Unit IV : Working with databases and setting sessions, cookies and FTP: Databases: creating, accessing, updating, inserting, deleting and sorting databases – Setting sessions, cookies and FTP: setting , reading, deleting cookies, working, downloading, uploading, deleting, creating and removing directories with FTP.	7	CO4
Unit V: AJAX Handling and Dynamic Server-Side Graphics AJAX and Drawing Images on the server: Ajax: Handling AJAX requests, downloading images using AJAX, downloading javascript with AJAX– Drawing images on the server: creating and displaying images, drawing lines, rectangles, ellipse, arcs, polygons, figures, individual pixels, text, virtual text, working with image files, tiling images, copying images.	7	CO5

Text Books 1 . "The Complete Reference PHP Covers PHP 5.2", Steven Holzner, Tata McGraw-Hill Edition 2008.
2. The Joy of PHP Programming: A Beginner's Guide – by Alan Forbes
3. PHP & MySQL Novice to Ninja – by Kevin Yank

REFERENCE BOOKS:
1. PHP6 and MySql6 Bible – Steve Svehring
2. PHP Programming Solutions – Vickram Viswani.

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Semester IV	Subject Code 4BCC03P	Name of Subject: PHP- LAB	
Total Hours Distribution per week			
Total Credit:1	**Lecture (L):**	**Tutorial(T): 2Hrs**	**Practical(P):2**
Examination Scheme			
Continual Assessment	**End Sem Examination**	**Total Marks**	**Examination Duration:**
25Marks	**25Marks**	**50Marks**	-

Course Objective
A PHP Lab course aims to provide hands-on experience in developing dynamic web applications using the PHP programming language.

Course Outcomes	
After successful completion of this course the students will be able to:	
CO1	Understanding the fundamentals of PHP, including its syntax, variables, data types, and operators.
CO2	Understanding to define and use functions to make their code reusable and organized.
CO3	Students will learn how to debug PHP scripts to identify and fix errors.
CO4	Understand the difference between client-side (JavaScript) and server-side (PHP) scripting and how to use them together.

CO-PO Articulating Matrix:

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	1	3	-	-	-	3	-	-
CO2	3	3	3	1	3	-	-	-	3	-	-
CO3	3	3	3	2	3	-	-	-	3	-	-
CO4	3	3	3	1	3	-	-	-	3	-	-

List of Practical's
1. Write a PHP Program for associative array.
2. Write a PHP Program to use various Functions of PHP.
3. Write a PHP Program for String handling
4 Write a PHP Program to read form data.
5 Write a PHP Program to implement Inheritance
6. Write a PHP Program to implement Overloading and overriding
7. Write a PHP Program for File handling.
8. Develop PHP Program to Create a Database and to Insert and Delete data.
9. Write a PHP Program to implement cookies.
10. Write a PHP Program for Drawing images on a web page

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Semester IV	Subject Code: 4BCC04T	Name of Subject: DATA WAREHOUSING & DATA MINING	
Total Hours Distribution per week			
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**

Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

	Course Objectives
1	To Understand Data mining principles ,techniques and Introduce DM as a cutting edge business intelligence
2	To expose the students to the concepts of Data warehousing Architecture ,OLAP and Implementation
3	To learn to use association rule mining for handling large data
4	To identify Business applications and Trends of Data mining

	Course Outcomes
After completion of syllabus, the student is able to	
1	Store voluminous data for online processing
2	Apply the association rules for mining the data
3	Analyze various classification techniques
4	Discover the knowledge imbibed in the high dimensional system
5	Understand the Fundamentals of Classification and Prediction

Course Competencies
1. Competencies include designing data marts and data warehouses, choosing appropriate dimensional models
2.Students should understand the core concepts of data mining, including its relationship to knowledge discovery in databases (KDD), and the different types of data mining tasks
3. Students should be proficient in data preprocessing techniques, including data cleaning, transformation, and reduction, to prepare data for effective data mining.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	-	-	3	-	-	-	2	-	2
CO2	3	3	-	-	2	-	-	-	3	-	1
CO3	2	3	-	-	3	-	-	-	2	-	2
CO4	3	3	-	-	3	-	-	-	3	-	2
CO5	2	2	-	-	2	-	-	-	2	-	1

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Data Mining: What motivated Data Mining? why it is important- What is Data Mining - Kind of Data – Data Mining Functionalities – Classification of Data Mining systems- Data Mining Task Primitives- Integration of a Data Mining system with a Database or Data Warehouse System Data Preprocessing: Why Preprocess the Data – Data Cleaning – Data Integration and Transformation – Data Reduction	8	CO1
Unit II: Data Warehouse and OLAP Technology:: What is Data Warehouse – A Multidimensional Data Model – From Tables and spreadsheets to Data Cubes-Stars, Snowflakes and Fact Constellations-Examples -Data Warehouse Architecture – From Data Warehousing to Data Mining.	7	CO2
Unit III: Data Cube Computation and Data Generalization Efficient Methods for Data Cube Computation -Attribute Oriented Induction-An Alternate Method for data Generalization and Concept Description Cluster Analysis: Definition – Types of Data – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods – Density Based Methods. Applications and Trends in Data Mining: Data Mining Applications - Trends in data Mining.	7	CO3
Unit IV : Mining Frequent Patterns, Associations: Basic Concepts and a Road map-Efficient and scalable Frequent Itemset Mining Methods-The Apriori Algorithm-Generating Association Rules from Frequents Itemsets-Mining Various kinds of Association Rules	7	CO4
Unit V: Classification and Prediction Classification and Prediction: What is Classification and Prediction – Classification by Decision Tree Induction– Bayesian Classification-Classification by back Propagation-Associative Classification:Classification by Association Rule Analysis- Prediction	7	CO5

Text Books

1 . Jiawei Han and Micheline Kamber „Data Mining Concepts and Techniques", Second Edition, Morgan Kaufmann Publishers 2006

REFERENCE BOOKS:

1 Pieter Adriaans, DolfZantinge, "Data Mining" , Pearson Education, 1998.

2 . Sam Anahory and Dennis Murray, "Data Warehousing in the Real World " Pearson Education, 1997..

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Semester IV	Subject Code: 4BSE02T	Name of Subject: INTRODUCTION TO MACHINE LEARNING	
Total Hours Distribution per week			
Total Credit:3	**Lecture (L):3Hrs**	**Tutorial(T):**	**Practical(P):--**

Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
30Marks	**20Marks**	**50Marks**	**100Marks**	**3Hours**

	Course Objectives
1	Familiarize the students with basics of probability and statics required for machine learning
2	Familiarize the students with Machine Learning methods to address data-driven scientific understanding
3	Equip the students with the basic tools of the emerging area
4	Introduce the students with deep learning techniques

	Course Outcomes
After completion of syllabus, the student is able to	
CO1	Appreciate the importance of visualization in the data analytics solution
CO2	Apply structured thinking to unstructured problems
CO3	Understand a very broad collection of machine learning algorithms and problems
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory
CO5	Understand the theoretical foundations of SVMs and the concept of the maximal margin classifier.

Course Competencies
1. Understanding supervised, unsupervised, and potentially reinforcement learning paradigms.
2.Skills in data preprocessing, feature engineering, and data augmentation.
3. Familiarity with linear regression, logistic regression, decision trees, and potentially support vector machines.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	3	2	-	3	-	-	-	-	-	3
CO2	3	2	3	-	2	-	-	-	-	-	2
CO3	3	2	2	-	3	-	-	-	-	-	3
CO4	2	3	3	-	3	-	-	-	-	-	3
CO5	3	2	3	-	2	-	-	-	-	-	2

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Introduction: Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.	7	CO1
Unit II: Neural Networks and Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.	8	CO2
Unit III Bayesian and Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – BayesianBelief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	7	CO3
Unit IV : Instant Based Learning: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning	7	CO4
Unit V: Support Vector Machines and Risk-Based Learning Models Support Vector Machine (SVM): Kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-basedbounds on risk, maximal margin classifier. Machine learning assessment and Improvement:Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.	7	CO5

Text Books

1. Tom M Mitchell, Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016

REFERENCE BOOKS:

1. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.

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Semester IV	Subject Code: 4BDS02T-A	Name of Subject: Mobile Application & Development (Elective – II)	
Total Hours Distribution per week			
Total Credit:2	Lecture (L):2Hrs	Tutorial(T):	Practical(P):--

Examination Scheme

Mid Sem Examination	Continuous Assessment	End Sem Examination	Total Marks	Examination Duration:
15Marks	10Marks	25Marks	50Marks	-Hours

Course Objectives	
1	To understand and learn programming languages specific to mobile app development.
2	To help students to gain a basic understanding of Android application development
3	To facilitate students to understand android SDK.
4	To Understand Testing Strategies for Android Applications

Course Outcomes	
After completion of syllabus, the student is able to	
CO1	To Understand Mobile Development Platforms and Tools
CO2	To design user interfaces (UIs) that are responsive and user-friendly.
CO3	To design effective and responsive user interfaces using different Android layouts
CO4	To understand Android SDK

Course Competencies
1. Understanding how to utilize frameworks like React Native, Flutter, or native Android and iOS development tools.
2. Knowledge of how to create intuitive and visually appealing interfaces that enhance user experience.
3.Ability to integrate external services and data through APIs.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	3	-	-	-	2	-	3
CO2	2	3	2	3	2	-	-	-	2	-	2
CO3	3	2	3	2	3	-	-	-	2	-	3
CO4	2	3	3	3	3	-	-	-	2		3

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I : Introduction to Android **Introduction to android**, Open handset alliance, Need of Android, Features of android, Understanding Anatomy of Android Application, Android Manifest file, Android architecture, Android Application Design Essentials: Anatomy of an Android applications.	6	CO1
Unit II: Android Terminologies Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	6	CO2
Unit3: Mobile App Deployment & Security: Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation,	6	CO3
Unit 4: Android SDK and testing Android SDK and its component. Testing & Debugging Mobile Applications, App Publishing (Google Play Store, App Store), Security & Performance Optimization.	6	CO4

Textbooks

1. Android Programming: The Big Nerd Ranch Guide – by Bill Phillips & Chris Stewart
2. Android Studio Development Essentials – by Neil Smyth
3. Mobile Application Development" – by Debabrata Ray & Ramesh Buyya (McGraw Hill)

References Books

1. Mobile Computing"- Raj Kamal (Oxford University Press)
2. Mobile Computing: Technology, Applications, and Service Creation" – by Asoke K. Talukder & Roopa R. Yavagal

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KDK College of Engineering,
Faculty of Science & Technology
Bachelor of Computer Application

Semester IV	Subject Code: 4BDS02T - C	Name of Subject: CLOUD COMPUTING (Elective – II)		
Total Hours Distribution per week				
Total Credit:2	Lecture (L):2Hrs		Tutorial(T):	Practical(P):--
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
15Marks	10Marks	25Marks	50Marks	-Hours

	Course Objective
1	To provide students with the fundamentals and essentials of Cloud Computing.
2	To provide students a sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3	To enable students exploring some important cloud computing driven commercial systems and applications.
4	To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research

	Course Outcomes
After completion of syllabus, the student is able to	
CO1	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO2	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO3	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO4	Understand and differentiate between various cloud deployment models.

Course Competencies
1. Understanding cloud computing concepts like IaaS, PaaS, SaaS, and serverless computing, as well as cloud deployment models (public, private, hybrid).
2. Developing skills in programming languages like Python, JavaScript, and scripting languages like Shell to build and manage cloud applications.
3.Understanding networking fundamentals and security principles in cloud environments to ensure data protection and secure cloud operations

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	-	-	-	-	-	-	1
CO2	2	3	1	-	-	-	-	-	-	-	2
CO3	3	2	1	-	-	-	-	-	-	-	2
CO4	2	3	2	-	-	-	-	-	-	-	1

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I: Cloud Computing Overview : Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.	6	CO1
Unit II: : Cloud Insights: Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.	5	CO2
Unit III Cloud Architecture- Layers Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.	6	CO3
Unit IV:Cloud Models Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing. Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud.	7	CO4

Text Books

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References Books

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

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KDK College of Engineering, Nagpur
Faculty of Science & Technology
Bachelor of Computer Application

Semester IV	Subject Code: 4BDS02T-B	Name of Subject: Business Intelligence (Elective – II)		
Total Hours Distribution per week				
Total Credit:2	**Lecture (L):2Hrs**	**Tutorial(T):**	**Practical(P):--**	
Examination Scheme				
Mid Sem Examination	**Continuous Assessment**	**End Sem Examination**	**Total Marks**	**Examination Duration:**
15Marks	**10Marks**	**25Marks**	**50Marks**	**-Hours**

Course Objectives	
1	To understand the fundamentals of Business Intelligence (BI) and its role in effective and timely decision-making.
2	To explore mathematical models and their applications in business decision-making.
3	To gain knowledge of data mining techniques and how they contribute to extracting useful patterns from large datasets.
Course Outcomes	
After completion of syllabus, the student is able to	
CO1	Explain business intelligence architectures and the ethical considerations in BI implementation.
CO2	Develop and evaluate mathematical models for decision-making processes.
CO3	Apply decision support system (DSS) models to real-world business scenarios.
CO4	Understand and apply relational marketing concepts to enhance customer value and retention.

Course Competencies
1.Students learn to differentiate between various data types, understand data quality, and identify potential biases
2.BI professionals need strong analytical and problem-solving skills to interpret data and identify relevant insights.
3. Students learn to apply both quantitative and qualitative methods to analyze business situations.

CO-PO Articulating Matrix

CO_PO Mapping											
	Programme Outcomes										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	3	3	-	-	-	-	-	3
CO2	2	3	3	2	3	-	-	-	-	-	2
CO3	3	2	3	2	2	-	-	-	-	-	3
CO4	2	3	2	3	2	-	-	-	-	-	2

SYLLABUS

Details of Topic	Hours	Mapped with CO
Unit I : Business intelligence **Business intelligence:** Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence **Decision support systems:** Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	6	CO1
Unit II: Mathematical models for decision making **Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models **Data mining:** Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	6	CO2
Unit III: Classification Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	6	CO3
Unit IV: Business intelligence applications **Business intelligence applications:** Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. **Data envelopment analysis:** Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	6	CO4

Textbooks

1. Business Intelligence: Data Mining and Optimization for Decision Making – by Bill Phillips & Chris Stewart- by Carlo Vercellis
2. Business Intelligence: A Managerial Perspective on Analytics" – by Ramesh Sharda, Dursun Delen, and Efraim Turban.
3. Data Mining: Concepts and Techniques" – by Jiawei Han, Micheline Kamber, and Jian Pei (Morgan Kaufmann).
4. Business Intelligence and Analytics: Systems for Decision Support" – by Ramesh Sharda, Dursun Delen, and Efraim Turban

References Books

- Decision support and Business Intelligence Systems – by Efraim Turban, Ramesh Sharda, Dursun Delen
- Fundamental of Business Intelligence – by Grossmann W, Rinderle-Ma
- Knowledge Management in Theory and Practice" – by Kimiz Dalkir

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