DPU

Dr. D. Y. PATIL VIDYAPEETH, PUNE

(Deemed to be University)

Syllabus for Bachelor of Computer Applications

(2023-24)

Semester 1 & 2

INDEX

REGULATION FOR THE BATCHLORS OF COMPUTER APPLICATION BCA (2023-24)

1. Eligibility

A candidate seeking admission to the BCA Course must have passed 10+2 (any stream) securing not less than 45% marks in aggregate (candidate belonging to open category and 40% candidate belonging to any reserved category) from the Central Board of Secondary Education/State boards or any other equivalent examination recognized by the Dr D. Y. Patil Vidyapeeth, Pune

2. Duration of the course

- The BCA program is of Four years (Total Eight semesters) degree program.
- Duration of the course: 4 years i.e. 8 semesters.
- Semesters - An academic year consists of two semesters Odd Semester: June/July to November/December
- Even Semester: November/December to April/May

Details are as Follow:

Type of award	Stage of exit	Mandatory credits to be secured
Certificate in the computer science	After the successful completion of semester II	44
Diploma in the field of computer science	After the successful completion of semester IV	88
Bachelor of Computer Science	After the successful completion of semester VI	132
Bachelor of Computer Science (**Honors**)	After the successful completion of semester VIII	164

3. Medium of instruction:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

4. Attendance:

A candidate has to secure minimum-

1. 75% attendance in theory
2. 80% in practical for qualifying to appear for the final examination.

(a) Internal Examinations (Theory + Practical + Project)

1. There shall be two internal examinations (also called internal assessment tests I and II) of one hour duration for each course to be held as per the schedule fixed in the Academic Calendar.

2. A student can take for supplementary re-internal exam of a specific subjector all the subjects for the betterment of performance in case of scoring of less mark in previous internal assessment exams only after successful submission of an application to the class teacher which will be approved by Director/Principal of the institute.
3. Project and Seminar will be evaluated on the basis of 50% internal assessment and 50% end semester assessment in the form of project demonstration and PPT.
4. Value added courses (VA) and ability/skill enhancement courses(AEC) will be evaluated through the continuous internal assessment(CIA) will be graded.

b) University Examination (Theory)

University Theory Examination Pattern		
Section A		
MCQs	15 x 1 Mark each	15 Marks
Section B		
1)Very short and short Qs (Any 5out of 7) 2)short question (Any 2 out 0f 3)	03 x 05 Marks each 02 x 05 Marks each	15 Marks 10 Marks
Section C		
Long Questions (Any 2 out of 3)	02 x 10 Marks each	20 Marks
	Total	**60 Marks**

Total 100 Marks Combined Head of Passing
External Theory will carry 60 marks
Internal Assessment (Theory) will carry total of 40 marks

Practical Examination scheme
External Practical will carry 60% marks
Internal Assessment (Practical) will carry total of 40 % marks

Break –Up
Final Theory University Exams 60 Marks
Internal Assessment Exams 40 Marks
Grand Total = 100 Marks (Each Subject)

Note: for any subject examination scheme will be

Internal exam/evaluation for Theory and lab : 40 %
(Unit Test 1, Unit Test 2 and continuous assessment over the semester)
External exam/evaluation for Theory and lab : 60%

6. Standard of Passing:
The standard of passing shall be minimum 50% in each subject.
The marks of all heads combined (University Theory Exam + Internal Assessment Theory + Practical / Viva) shall be considered together for Passing of the candidate.

(c) Grace Marks
The grace marks up to a maximum of 1 percentage of total marks may be awarded to a student who has failed in not more than two subjects in the respective semester. Provided that these grace marks shall be awarded only if the student passes after awarding these marks.

(d) Grading System
UGC 10-point Grading Scale

Marks	Letter Grade	Grade Point
90 To 100	**O** : Outstanding	10
80 To 89	**A+** : Excellent	9
70 To 79	**A** : Very Good	8
60 To 69	**B+** : Good	7
55 To 59	**B** : Average	6

50 To 54	**P** :	Pass	5
00 To 49	**F** :	Fail	0
-	**AB** :	Absent	0

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = Σ(Ci x Gi) / ΣCi

where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

CGPA = Σ(Ci x Si) / Σ Ci where Si is the SGPA of the semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

(i) Criteria for appointment of Examiner (Internal & External) and terms of their appointment.

1. Adhoc Board of Studies of BCA shall submit, to the Committee constituted by Board of Examinations, a panel of examiner names, along with their addresses, suitable for appointment as Internal and External Examiners.

2. Examiners shall be appointed by the Academic Council as per section 8(b) (viii) of the Rules of Dr. D. Y. Patil University on the recommendations of the Board of Examinations.

3. In case of refusal from the person so appointed, the Controller of Examinations shall appoint substitute examiners from the panel approved.

4. Internal and External Examiners: An "Internal Examiner" means a person who is a teacher in the constituent college(s) / institute(s) of the University. The teachers in other universities or recognized teachers of other Universities in the state or outside the state shall be referred to as the “External Examiner".

5. Intimation of appointment as the examiner shall be accompanied by a copy of the instructions/guidelines relating to the examination for he/she is appointed, as also the information regarding the remuneration he/she shall be entitled to draw, if he/she acts as examiner. He/ She is expected to attend to and shall be required to send to the Controller of Examinations.

6. Examiners shall be appointed for examinations to be held in that academic year; however they shall be eligible for reappointment.

7. Relatives, Close Friends or next to the kin which are directly or indirectly related to the candidates shall not to be included.

Dr D. Y. Patil School of Science &Technology,
Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

Bachelor of Technology

Program Outcomes (POs)

Learners are expected to know and be able to–

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

(PSO)	
A graduate of the Computer Engineering Program will demonstrate-	
PSO1	**Professional Skills**-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.
PSO2	**Problem-Solving Skills**- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	**Successful Career and Entrepreneurship**- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.

COURSE STRUCTURE FOR

BACHELOR OF COMPUTER APPLICATION (BCA)

Undergraduate Certificate in Computer Applications after securing 44 credits	**SEMESTER I**							
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-101	Major	Problem Solving and Programming In C	3	0	4	7	5
	BCA-CA-102	Major	Discrete Mathematics and Graph Theory	4	0	0	4	4
	BCA-CA-103	Major	Computer Organization and Architecture	3	0	2	5	4
	PCC-CA-101	VA	Value Added Course – I	1	0	2	3	2
	PEC-CA-101	DSE	Discipline Specific Elective -1	3	0	4	7	5
	HSMC-CA-101	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
	Total			16	0	12	28	22
	DSE – 1 Design Patterns, Software Architecture, Software Engineering Principles **VA** : Professional Communication Skills **AEC** : Yoga for Well-Being/ Health and Wellness/ Office Automation/ Human Values And Professional Ethics							
		SEMESTER II						
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-201	Major	Object Oriented Programming	3	0	4	7	5
	BCA-CA-202	Major	Statistics for Engineers	4	0	0	4	4
	BCA-CA-203	Major	Principles of Database Systems	3	0	4	7	5
	PCC-CA-201	VA	Value Added Course	1	0	2	3	2
	PEC-CA-201	DSE	Discipline Specific Elective -2	2	0	4	6	4
	HSMC-CA-201	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
	Total			15	0	14	29	22
	DSE - 2: ReactJS/ Angular/HTML5/Javascript/PHP **VA** : Environmental Studies **AEC :** Centre for Social Activities, Department Specific Community Engagement Programme,, Literary and Culture, National Cadet Corps, National Service Scheme, Unnat Bharat Abhiyan, Youth Red Cross							
Undergraduate Diploma in		**SEMESTER III**						
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-301	Major	Data Structures	3	0	4	7	5

Computer Application after securing 88 credits	BCA-CA-302	Major	Advanced Database Management Systems	4	0	0	4	4
	BCA-CA-303	Major	Operating System Principles	3	0	4	7	5
	PCC-CA-301	VA	Value Added Course	1	0	2	3	2
	PEC-CA-301	DSE	Discipline Specific Elective -3	2	0	4	6	4
	HSMC-CA-301	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
		Total		15	0	14	29	22
		DSE-3: Programming in Python/Java/C#/Ruby **VA** : Project Management **AEC** : Sports-I / Language-I (French/German/Japanese/Marathi) Intern ship / Apprenticeship						
		SEMESTER IV						
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-401	Major	Design and Analysis of Algorithms	3	0	4	7	5
	BCA-CA-402	Major	System Programming	4	0	0	4	4
	BCA-CA-403	Major	Cloud Computing Methodologies	3	0	4	7	5
	PCC-CA-401	VA	Value Added Course	1	0	2	3	2
	PEC-CA-401	DSE	Discipline Specific Elective -4	2	0	4	6	4
	HSMC-CA-401	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
		Total		15	0	14	29	22
		DSE-4: Advanced Server-Side Programming/ Software Application Architecture/ Software Project Management **VA** : Organizational Behavior **AEC** : Sports-II/ Language-II (French/German/Japanese/Marathi)/ Intern ship / Apprenticeship						
Bachelor in Computer Applications after securing 110 credits		**SEMESTER V**						
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-501	Major	Introduction to DataScience	3	0	4	7	5
	BCA-CA-502	Major	Formal Languages and Automata Theory.	4	0	0	4	4
	BCA-CA-503	Major	Data Communication And Networks	3	0	4	7	5
	PCC-CA-501	VA	Value Added Course	1	0	2	3	2
	PEC-CA-501	DSE	Discipline Specific Elective -5	2	0	4	6	4

	HSMC-CA-501	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
	Total			15	0	14	27	22
	DSE- 5: DevOps/Cloud (AWS/Azure)/Blockchain Technologies/NoSQL **VA :** Financial Education and Investment Awareness **AEC :** Internship / Apprenticeship							
		SEMESTER VI						
	Course Code	**Course Type as per NEP**	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
	BCA-CA-601	Major	Applied Cryptography and Network Security	3	0	4	7	5
	BCA-CA-602	Major	Artificial Intelligence and Experts Systems	3	0	4	7	5
	BCA-CA-603	Major	Compiler Design	3	0	2	5	4
	PCC-CA-601	VA	Value Added Course	1	0	2	3	2
	PEC-CA-601	DSE	Discipline Specific Elective -6	2	0	4	6	4
	HSMC-CA-601	AEC	Ability/Skill Enhancement Course	2	0	0	2	2
		Total		14	0	16	30	22
		DSE- 6: Software Verification and Validation/ Software Testing / Software Project Management **VA :** Research Methodology & Ethics **AEC** : Internship / Apprenticeship						
Bachelor in Computer Science (Honors) after securing 142 credits		**SEMESTER VII**						
		Course Type as per NEP	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
		Major	Research Project -I	0	0	32	32	16
		Total				32	32	16
		SEMESTER VIII						
		Course Type as per NEP	**Course Name**	**L**	**T**	**P**	**Hr**	**Cr**
		Major	Research Project -II	0	0	32	32	16
		Total				32	32	16

SEMESTER - I

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-101: Problem solving & Programming using C

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	**05**	**Mid_Semester(TH): 40 Marks**
		End_Semester(TH): 60 Marks

Prerequisites: The course requires the basic knowledge about the Computer system.

Companion Course: --

Course Objectives:

The objective of the course is

1. To familiarize the students with computers and programming concepts.
2. Programming module is intended to familiarize them with computer logic and solution of real world problems using C and C++ programming languages.

Course Outcomes:

At the end of this course, students will be able to:

CO1. Understand the organization of computers and the basic principles of Computing

CO2. Deal with the basics problems that arise while using computers

CO3. Demonstrate the basics of C Programing and their applications

CO4. Apply programming for solving biological problems by string based approach

CO5. Repeat the sequence of instructions and points for a memory location

CO6. Understand the basics of file handling mechanisms

CO7. Demonstrate the basics of object oriented programming (C++)

Course Contents

Unit I	**Basics of programming & Introduction to C**	**(06 Hours)**
History of computer and various parts and functions performed by them , Various hardware of computer, Application software and system software , Various functions of operating system, MS-DOS, LINUX commands, Machine language, High level language, Compilation process ,An overview of C, C expressions, Operators, Data types		
Mapping of Course Outcomes	CO 1	
Unit II	**The Decision controls & Control**	**(08 Hours)**

	structures	
If statements within if, Multiple statements within if, if-else statement, The! operator Hierarchy of Logical Operators, The Conditional Operators, What are Control structures, need of control structures , While‘ Loop, for‘ loop , Nesting of Loops , Multiple Initializations in the for loop The Odd‘ Loop, The break‘ statement, The continue‘ statement, The do-while‘ statement, Decisions using switch , Go To Statements		
Mapping of Course Outcomes	CO 2	
Unit III	**Functions**	**(04 Hours)**
What is a function? Why Use Functions Passing values between functions, Scope of functions		
Mapping of Course Outcomes	CO 3	
Unit IV	**Array & strings**	**(03 Hours)**
Single-dimension Arrays, Generating a Pointer to an array, Passing single dimension , arrays to functions, Strings, Two-dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array , Initialization, Variable-Length arrays What are Strings? More about Strings , Pointers and Strings , Standard Library String functions ,Two-Dimensional Array of Characters, Array of pointers to Strings		
Mapping of Course Outcomes	CO 4	
Unit V	**Pointers, Structures, Union, Enumeration & type definition**	**(09 Hours)**
Pointer variables , The pointer Operators , Pointer Expressions , Pointers and Arrays , Initializing Pointers, Pointers to Functions, C‘s Dynamic Allocation Arrays , Structures, Arrays of structures, Passing structures to functions, Structure Pointers, Unions, Bit-Fields , Enumerations ,Typedef		
Mapping of Course Outcomes	CO 5	
Unit VI	**File Handling in C**	**(06 Hours)**
Opening and closing a stream, open modes, Reading and writing to/from a stream, Predefined streams: stdin, stdout and stderr, Stream manipulation: fgetc(), fputc(), fgets() and fputs() functions		
Mapping of Course Outcomes	CO 6	
Unit VII	**Introduction To Object-Oriented Programming(C++)**	**(07 Hours)**
Introduction – Procedure vs. object oriented programming – Data types – control structures – Arrays and Strings – User defined types – Functions and Pointers – Case study , Classes and Objects – Operator Overloading – Inheritance – Polymorphism and Virtual Functions – Case study		
Mapping of Course Outcomes	CO 7	

List of practical’s

1. Introduction to Microsoft Word and Microsoft Power point
2. Introduction to Microsoft Excel and MS-DOS commands
3. Programs on basic programming in C
4. Programs using Decision Controls in C

5. Programs using while, do-while and for Loop
6. Programs using Case Control Structure, odd loop
7. Programs illustrating use of function
8. Programs illustrating use of arrays
9. Programs using Pointers and Structure
10. Programs illustrating use of String
11. Programs for file handling in C
12. Programs in basic programming in C++
13. Basic programs for object oriented concepts using C++
14. Programs for Biological application

- Finding complement of DNA
- ORF finding
- Inverted Repeats
- Motif finding
- Translation
- Transcription

Learning Resources

Text Books:

1. The complete reference of C by H. Schildt, 4th edition, Mc Graw Hill, 2003.
2. Let us C By Y. Kanitkar, 15th edition, BPB Publication, 2017.
3. Data Structure Through C by Y. Kanitakar, 2nd edition, BPB Publication, 2003.
4. Understanding Pointers in C by Y. Kanitakar, 4th edition, BPB Publication, 2007.
5. Data Structure using C and C++ by A. M. Taneumbam, 2nd edition, PHI, 2017.
6. Computers Fundamentals by P K Sinha and P. Sinha, 6th edition, BPB publications, 2004.
7. HM Deitel and PJ Deitel —C++ How to Program‖, Seventh Edition, 2010, Prentice Hall.
8. E Balagurusamy, —Object oriented Programming with C++‖, Third edition, 2006, Tata McGraw Hill.
9. Robert Lafore, —Object Oriented Programming in C++‖, 2002, Pearson education.

Reference Books:

eBooks:

MOOC/ Video Lectures available at:

@The CO-PO Mapping Matrix

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-102: Discrete Mathematics and Graph Theory

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 04 Hours/Week	**04**	**Mid_Semester (TH): 40 Marks** End _Semester (TH): 60 Marks

Prerequisites: Basic knowledge of fundamental mathematics is required
Companion Course: ---

Course Objectives:

1. To learn the fundamental concepts like set, relations, functions, graph, coding theory.
2. To understand the related operations and terminologies in context of problem by applying suitable set, function, and relation models to real instances.
3. To use simple programming statements and expressions to demonstrate different solutions/approach.
4. To understand use of set theory, graph theory, algebraic structure.
5. To formulate the problems, solve them, use formal proof techniques, and explain reasoning.
6. Apply recursive functions and solve recurrence relations
7. To learn to express algorithmic ideas mathematically.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. To identify set, discrete numerical functions.

CO2. To understand the various properties of algebraic structures.

CO3. To apply combinatorial problems using basic computing principles.

CO4. To determine critical thinking, analytical reasoning, and problem-solving abilities.

CO5. To interpret data and solve problems, use appropriate mathematical and statistical concepts and operations.

CO6. To apply set, proposition in problem solving.

Course Contents

Unit I	**Sets and Propositions**	**(08 Hours)**
Sets, set combinations, finite and infinite sets, countably infinite sets, inclusion and exclusion principle, multi-sets Propositions, Conditional Propositions, Logical Connectivity, Prepositional Calculus, Universal and Existential Quantifiers, Standard Forms, Proof Methods, Mathematical Induction		
Mapping of Course Outcomes	CO1	
Unit II	**Relations and Functions**	**(07 Hours)**
Binary Relationship Properties, Relationship severance Warshall's algorithm, Job scheduling problem using discrete numeric functions and generating functions. Homogeneous Solutions, Linear Recurrence Relations with Constant Coefficients, and Recurrence Relations.		
Mapping of Course Outcomes	CO2	
Unit III	**Algebraic**	**(08 Hours)**

	structures	
The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and Congruence relations, Rings, Integral Domains and Fields, Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph –Isomorphism – Eulerian and Hamiltonian Walks –Rooted Trees, Trees and Sorting.		
Mapping of Course Outcomes	CO3	
Unit IV	**Graph Theory**	**(08Hours)**
Basic terminology, graph representation in computer memory, multi-graphs and weighted graphs, Subgraphs, Isomorphic graphs Operations on graphs, paths and circuits, Hamiltonian and Euler paths and circuits, shortest path in weighted graphs (Dijkstra's algorithm), factors of a graph, planer graph and Traveling salesman problem, Graph Coloring		
Mapping of Course Outcomes	CO4	
Unit V	**Trees**	**(07 Hours)**
Basic terminology and characterization of trees, Prefix codes and optimal prefix codes, binary search trees, Tree traversal, spanning trees, Fundamental Trees and cut sets, Minimal Spanning trees, Kruskal's and Prim's algorithms for minimal spanning trees, The Max flowMin Cut Theorem (Transport network).		
Mapping of Course Outcomes	CO5	
Unit VI	**Coding Theory**	**(05 Hours)**
Coding theory, Polynomial Rings and polynomial Codes, Galois Theory –Field Theory and Group Theory.		
Mapping of Course Outcomes	CO6	

Learning Resources

Text Books:

1. Kenneth H. Rosen, "**Discrete Mathematics and its Applications: with Combinatorics and Graph Theory**", 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "**Discrete Mathematical Structure with Applications to Computer Science**", Tata Mc Graw Hill Education (India) Edition 1997.
3. Norman L. Biggs, "**Discrete Mathematics**", 2nd Edition, Oxford University
4. Narsingh Deo, "**Graph theory with applications to Engineering and Computer Science**", Prentice Hall Inc., Englewood Cliffs,N.J., 1974.
5. Susanna S. Epp, "**Discrete Mathematics with Applications**", 4th edition, Brooks/Cole, Cengage Learning, 2010.

Reference Books:

eBooks:

MOOC/ Video Lectures available at:

@The CO-PO Mapping Matrix

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-103: Computer System Organization & Architecture

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	**04**	**Mid_Semester (TH): 40 Marks** End _Semester (TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.
Companion Course: ---

Course Objectives:

The educational Objectives of this Course are:

1. To have a thorough understanding of the basic structure and operation of a digital computer.
2. To study the different ways of communicating with I/O devices and standard I/O interfaces.
3. To learn the architecture and assembly language programming of 8085 microprocessor.
4. To study peripherals and their interfacing with 8085 microprocessor.

Course Outcomes:

CO 1. Understanding Logic gates, flip flops and counter
CO 2. Clear Understanding of Computer Architecture
CO 3. Pipeline processing RISC and CISC architectures.
CO 4. Develop a base for advance micro-processors.
CO 5. To notice how to perform computer arithmetic operations
CO 6. To be clear with pipeline procedure and multi processors.

Course Contents

Unit I	**Boolean Algebra and Logic Gates**	**(06 Hours)**
Basic definition, Axiomatic Definition, Basic theorem and Properties of Boolean algebra, Minterms and Maxterms, Logic Operations, Digital logic gates, IC digital logic families		
Mapping of Course Outcomes	CO1	
Unit II	**Simplification of Boolean functions**	**(06 Hours)**
Different types map method, product of sum simplification, NAND or NOR implementation, Don't care condition, Tabulation method, Adder, subtractor, Code Conversion, Universal Gate.		
Mapping of Course Outcomes	CO2	
Unit III	**Sequential Logic**	**(06 Hours)**
Flip-flops, Triggering of Flip-flops, Analysis of clocked sequential circuits, State reduction and Assignment, Flip-flop excitation, Design of counters, Design with state equations		
Mapping of Course Outcomes	CO3	
Unit IV	**Overview Of Register Transfer And Micro**	**(06 Hours)**

	operations	
Register Transfer Language, Register transfer. Bus and Memory transfer, Arithmetic Micro-operations. Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.		
Mapping of Course Outcomes	CO4	
Unit V	**Basic Computer Organization And Design**	**(07 Hours)**
Instruction codes, Computer registers, Computer instructions. Timing and Control, Instruction cycle. Memory-Reference Instructions, Input-output and interrupt. Design of Basic computer, Design of Accumulator Unit.		
Mapping of Course Outcomes	CO5	
Unit VI	**Programming The Basic Computer**	**(09 Hours)**
Introduction, Machine Language, Assembly Language, the Assembler. Program loops. Programming Arithmetic and logic operations. Subroutines. I-O Programming. Central Processing Unit Introduction: General Register Organization, Stack Organization Instruction format. Addressing Modes Data transfer and manipulation Program Control, Reduced Instruction Set Computer (RISC).		
Mapping of Course Outcomes	CO6	

Learning Resources

Text Books:

1. Computer System Architecture: By M. Morris Mano.
2. Structured Computer Organization: By Tanenbaum.
3. Computer Organization: By Stallings.
4. Computer Architecture and Organization: By Hayes.

Reference Books:

eBooks:

MOOC/ Video Lectures available at:

@The CO-PO Mapping Matrix

SEMESTER - II

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-201: Object Oriented Programming

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	**05**	**Mid_Semester (TH): 40 Marks**
		End_Semester (TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.

Companion Course: ---

Course Objectives:

1. To understand the basic concepts and fundamentals of platform independent object oriented language.
2. To demonstrate skills in writing programs using exception handling techniques and multithreading.
3. To understand streams and efficient user interface design techniques

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO 1. Use the syntax and semantics of java programming language and basic concepts of OOP.
CO 2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO 3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
CO 4. Design event driven GUI and web related applications which mimic the real word scenarios
CO 5. The students will be able to demonstrate programs on exceptions, multithreading and Applets

Course Contents

Unit I	**Introduction to Database Object Oriented Thinking and Java Basics**	**(07 Hours)**
Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.		
Mapping of Course Outcomes	CO1	
Unit II	**Inheritance, Packages and Interfaces**	**(07 Hours)**
Inheritance, Packages and Interfaces: Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class. Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.		
Mapping of Course Outcomes	CO2	
Unit III	**Exception Handling and Multithreading**	**(07 Hours)**

Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.
String Handling, Exploring Java. Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads.
Enumerations, Autoboxing, Annotations, Generics.

Mapping of Course Outcomes	CO3

Unit IV	**Event Handling**	**(07 Hours)**

Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.
The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

Mapping of Course Outcomes	CO4

Unit V	**Applets**	**(07Hours)**

Concepts of Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.
Swing:
Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables

Mapping of Course Outcomes	CO5

List of Practical's

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions
2. Write a java program to multiply two given matrices
3. Write a java program for Method overloading and Constructor overloading
4. Write a java program to display the employee details using Scanner class
5. Write a java program that checks whether a given string is palindrome or not
6. Write a java program to represent Abstract class with example. Write a java program to implement Interface using extends keyword.
7. Write a java program to create inner classes. Write a java program to create user defined package
8. Write a java program for creating multiple catch blocks. Write a java program for producer and consumer problem using Threads
9. Write a Java program that implements a multi-thread application that has three threads.
10. Write a java program to display File class properties. Write a java program to represent the ArrayList class. Write a Java program loads phone no, name from a text file using hash table
11. Write an applet program that displays a simple message
12. Write a Java program compute factorial value using Applet. Write a program for passing parameters using Applet

Learning Resources

Text Books:

1. Java the Complete Reference, 7th Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

Reference Books:

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson-Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

eBooks:

MOOC/ Video Lectures available at:

@The CO-PO Mapping Matrix

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-202: Statistics for Engineers

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 04 Hours/Week	**04**	**Mid_Semester (TH): 40 Marks** End _Semester (TH): 60 Marks

Prerequisites:

Companion Course: ---

Course

Objectives:

The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline

Course Outcomes:

The students will learn:

CO1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
CO2. The basic ideas of statistics including measures of central tendency, correlation and regression.
CO3.The statistical methods of studying data samples.
CO4.Communicate the results of statistical analyses effectively.
CO5.Be able to understand and apply the basic concepts of statistical inference, confidence limits and hypothesis testing.
CO6.The overall course objective is to understand basic concepts of probability and statistics and to be able to use them to solve engineering problems.

Course Contents

Unit I	**Basic Probability**	**(12 Hours)**
Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.		
Mapping of Course Outcomes	CO1	
Unit II	**Continuous Probability Distributions**	**(08 Hours)**
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.		
Mapping of Course Outcomes	CO2	
Unit III	**Bivariate Distributions**	**(07 Hours)**
Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.		

Mapping of Course Outcomes	CO3

Unit IV	**Basic Statistics**	**(06Hours)**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Mapping of Course Outcomes	CO4

Unit V	**Applied Statistics**	**(07 Hours)**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Mapping of Course Outcomes	CO5

Unit VI	**Small samples**	**(06 Hours)**

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Mapping of Course Outcomes	CO6

List of Practical:

Learning Resources

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Reference Books:

eBooks:

MOOC/ Video Lectures available at:

@The CO-PO Mapping Matrix

Dr D. Y. Patil School of Science &Technology, Dr D. Y. Patil Vidyapeeth, Pimpri, Pune

BCA-CA-203: Principles of Database Management Systems

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Lecture: 03 Hours/Week	**05**	**Mid_Semester (TH): 40 Marks** End _Semester (TH): 60 Marks

Prerequisites: Basic knowledge of Data Structures and Algorithms, Discrete Mathematics is required.

Companion Course: ---

Course Objectives:

1. To understand the fundamental concepts and the applications of Database Management Systems.
2. To acquire the skillset to use flexible databases for real applications.
3. To get familiar with Data Collection and Design techniques.
4. To design a Database Management Systems for scalable projects.
5. To relate different DB languages like MySQL, Noe4J, Riak, MongoDB.
6. To understand the relational database design principles.

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1. To analyze and design the basic elements of a relational database management system.

CO2. To learn to normalize the databases using single value normalization.

CO3. To identify the relevant data models for problems.

CO4. To design and evaluate entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.

CO5. To interpret the query evaluation and optimization techniques.

CO6. Apply Nosql development tools on different types of NoSQL Databases

Course Contents

Unit I	**Introduction to Database**	**(06 Hours)**
Database Concepts, Database System Architecture and Data Modeling: Data Models, Basic Concepts, entity, attributes, relationships, constraints, keys. E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables, legacy system model. Relational Model: Basic concepts, Attributes and Domains, Codd's Rules. Relational Integrity: Domain, Entity, Referential Integrities, Enterprise Constraints, Schema Diagram. Relational Algebra: Basic Operations, Selection, projection, joining, outer join, union, difference, intersection, Cartesian product, division operations (examples of queries in relational algebraic using symbols).		
Mapping of Course Outcomes	CO1	
Unit II	**Data Collection**	**(06 Hours)**
Data Processing - Data collection; Data preparation; Training a model on the data; Evaluation of the model performance ; Data visualization techniques and inferences - scatter plot, scatter matrix, histogram, box plot.		
Mapping of Course Outcomes	CO2	

Unit III	Database Design &SQL	(08 Hours)
Functional Dependency, Purpose of Normalization, Data Redundancy and Update Anomalies, Single Valued Normalization: 1NF, 2NF, 3NF, BCNF. Decomposition: lossless join decomposition and dependency preservation, Multi valued Normalization (4NF), Join Dependencies and the Fifth Normal Form. Introduction to SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, Nulls SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries		
Mapping of Course Outcomes	CO3	

Unit IV	Query Processing and Database transactions	(06Hours)
Query Processing: Overview, Measures of query cost, Evaluation of expression, Materialization and Pipelining algorithm. Transaction: Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and No recoverable Schedules. Concept of Stored Procedures, Cursors, Triggers, assertions, roles and privileges Programmatic SQL: Embedded SQL, Dynamic SQL, Advanced SQL-Programming in MYSQL.		
Mapping of Course Outcomes	CO4	

Unit V	Concurrency Control	(07 Hours)
Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods, and Optimistic Techniques. Recovery Methods: Shadow-Paging and Log-Based Recovery, Checkpoints, Performance Tuning, Query Optimization		
Mapping of Course Outcomes	CO5	

Unit VI	NoSQL databases	(07 Hours)
Introduction, Overview, and History of NoSQL Databases – The Definition of the Four Types of NoSQL Databases, Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra NoSQL Key/Value databases using MongoDB, NoSQL Key/Value databases using Riak, Graph NoSQL databases using Neo4J, NoSQL database development tools and programming languages Future Trends for NoSQL databases		
Mapping of Course Outcomes	CO6	

List of Practical:

Assignments from all Groups (A, B, C) are compulsory.

Group- A:

1. Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)
2. Install and configure client and server for MySQL and MongoDB (Show all commands and necessary steps for installation and configuration).
3. Perform the following: a. Viewing all databases, creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)
4. Perform the following: a. Altering a Table, Dropping/Truncating/Renaming Tables, backing up / Restoring a Database.
5. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving-

Date Functions, String Functions, Math Functions Join Queries- Inner Join, Outer Join Subqueries- with IN clause, With EXISTS clause.

6. For a given set of relation tables perform the following a. Creating Views (with and without check option), Dropping views, Selecting from a view.
7. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
8. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.
9. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java and demonstrates how a banking debit transaction might be done.
10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.
11. Study the Riak database and its uses. Also elaborate on building and installing of Riak.

Group B-
MongoDB/Apache Cassandra Queries:

1. Design and Develop MongoDB/Apache Cassandra Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators etc.).
2. MongoDB/Apache Cassandra - Aggregation and Indexing: Design and Develop MongoDB Queries using aggregation and indexing with suitable example using MongoDB.
3. MongoDB/Apache Cassandra - Map reduces operations: Implement Map reduces operation with suitable example using MongoDB.
4. Database Connectivity: Write a program to implement MongoDB database connectivity

Note* - Teachers can take the flexibility to use any other advanced tools Instead of MongoDB/Apache Cassandra

Group C-
Using the database concepts covered in Group A and Group B, develop an application with following details: 1. Follow the same problem statement decided in Assignment -1 of Group A.
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.
5. Student should develop application in group of 2-3 students and submit the Project Report which will consist of documentation related to different phases of Software Development Life Cycle:

- Title of the Project, Abstract, Introduction
- Software Requirement Specification
- Conceptual Design using ER features, Relational Model in appropriate Normalize form
- Graphical User Interface, Source Code
- Testing document
- Conclusion.

Learning Resources

Text Books:

1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi,India

2. Elmasri Navate, Fundamentals of Database Systems, Pearson Education,India.