

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (1st Semester) for Under-Graduate Programmes

Bachelor of Computer Applications
(Artificial Intelligence)

BCA(AI)

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based
Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted From 2023-2024)

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2023-24, Syllabus: 2023-24 | | | |
|---|---|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (AI) | | |
| Semester | I | | |
| Name of the Course | Problem Solving through C | | |
| Course Code | B23-CAL-101 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-A1 | | |
| Level of the course (As per Annexure-I) | 100-199 | | |
| Pre-requisite for the course (if any) | | | |
| Course Learning Outcomes(CLO): | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. learn the basics of C program, data types and input/output statements. 2. understand different types of operators, their hierarchies and also control statements of C. 3. implement programs using arrays and strings. 4. get familiar with advanced concepts like structures, union etc. in C language. <hr style="width: 30%; margin-left: 0;"/> <p>5*. to implement the programs based on various concepts of C.</p> | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Part B- Contents of the Course | | | |

Instructions for Paper- Setter

Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|-------------|---|----------------------|
| I | Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant. Input/output: Formatted I/O Function-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), output functions viz. printf(), putchar(), puts(). | 11 |
| II | Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion. Decision making with if statement, if-else statement, nested if statement, else-if ladder, switch, break and continue statement, goto statement, Looping Statements: for, while, and do- while loop, jumps in loops. | 11 |
| III | Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation. Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions. Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring. | 12 |
| IV | Pointers in C: Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays. User defined data types: Structures - Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union. | 11 |
| V* | Practicum: Students are advised to do laboratory/practical practice not limited | 30 |

| | | |
|--|--|--|
| | <p>to, but including the following types of problems:</p> <ul style="list-style-type: none"> • To read radius of a circle and to find area and circumference • To read three numbers and find the biggest of three • To check whether the number is prime or not • To read a number, find the sum of the digits, reverse the number and check it for palindrome • To read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers • To read percentage of marks and to display appropriate message (Demonstration of else-if ladder) • To find the roots of quadratic equation • To read marks scored by n students and find the average of marks (Demonstration of single dimensional array) • To remove Duplicate Element in a single dimensional Array • To perform addition and subtraction of Matrices • To find factorial of a number • To generate Fibonacci series • To remove Duplicate Element in a single dimensional Array • To find the length of a string without using built in function • To demonstrate string functions • To read, display and add two m x n matrices using functions • To read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters • To Swap Two Numbers using Pointers • To demonstrate student structure to read & display records of n students • To demonstrate the difference between structure & union. | |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | <p>End Term Examination: A three hour exam for both theory and practicum.</p> | |
| Part C-Learning Resources | | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Gottfried, Byron S., Programming with C, Tata McGraw Hill. • Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. • Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison | | |

Wesley.

- Yashwant Kanetker, Let us C, BPB.
- Rajaraman, V., Computer Programming in C, PHI.
- Yashwant Kanetker, Working with C, BPB.

*Applicable for courses having practical component.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2023-24, Syllabus: 2023-24 | | | |
|---|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA(AI) | | |
| Semester | I | | |
| Name of the Course | Foundations of Computer Science | | |
| Course Code | B23-CAL-102 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-B1 | | |
| Level of the course (As per Annexure-I) | 100-199 | | |
| Pre-requisite for the course (if any) | | | |
| Course Learning Outcomes(CLO): | After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. understand the basics of computer 2. learn about I/O devices and operating systems 3. understand the Internet and its services 4. learn about the threats and security concepts on computers <hr style="width: 30%; margin-left: 0;"/> 5*. to understand the operating system's working, internet, and security-related concepts. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper- Setter</u> | | | |
| Examiner will set a total of nine questions. Out of which first question will be compulsory. | | | |

Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|-------------|---|----------------------|
| I | <p>Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields. Types of Software: System software, Application software, Utility Software, Shareware, Freeware, Firmware, Free Software.</p> <p>Memory Systems: Concept of bit, byte, word, nibble, storage locations and addresses, measuring units of storage capacity, access time, concept of memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory.</p> | 11 |
| II | <p>I/O Devices: I/O Ports of a Desk Top Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices - mouse, touch pad and track ball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, ink jet, dot-matrix. Plotter.</p> <p>Introduction to Operating System: Definition, Functions, Features of Operating System, Icon, Folder, File, Start Button, Task Bar, Status Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.</p> | 12 |
| III | <p>The Internet: Introduction to networks and internet, history, Internet, Intranet & Extranet, Working of Internet, Modes of Connecting to Internet.</p> <p>Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines.</p> | 11 |
| IV | <p>Threats: Physical & non-physical threats, Virus, Worm, Trojan, Spyware, Keyloggers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking.</p> <p>Computer Security Fundamentals: Confidentiality, Integrity, Authentication, Non-Repudiation, Security Mechanisms, Security Awareness, Security Policy, anti-virus software & Firewalls, backup</p> | 11 |

| | | |
|--|--|--|
| | & recovery. | |
| V* | <p>Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:</p> <p>Operating System:</p> <ul style="list-style-type: none"> Starting with basics of Operating Systems and its functionalities <p>Computer Basics:</p> <ul style="list-style-type: none"> Identify the various computer hardware Understanding the working of computer Understanding various types of software <p>Internet and E-mail:</p> <ul style="list-style-type: none"> Using Internet for various tasks Creating and using e-mail. <p>Security:</p> <ul style="list-style-type: none"> Understanding various threats How to be safe from virus threats Various software to get safe from virus attacks. | 30 |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <ul style="list-style-type: none"> > Theory <ul style="list-style-type: none"> Class Participation: 5 Seminar/presentation/assignment/quiz/class test etc.: 5 Mid-Term Exam: 10 > Practicum <ul style="list-style-type: none"> Class Participation: NA Seminar/Demonstration/Viva-voce/Lab records etc.: 10 Mid-Term Exam: NA | | <p>End Term Examination: A three-hour exam for both theory and practicum.</p> |
| Part C-Learning Resources | | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. Dromey, R.G., How to Solve it By Computer, PHI. Norton, Peter, Introduction to Computer, McGraw-Hill. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. Rajaraman, V., Fundamentals of Computers, PHI. | | |

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

| Scheme: 2023-24, Syllabus: 2023-24 | | | |
|---|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA(AI) | | |
| Semester | I | | |
| Name of the Course | Logical Organization of Computer | | |
| Course Code | B23-CAL-103 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-C1 | | |
| Level of the course (As per Annexure-I) | 100-199 | | |
| Pre-requisite for the course (if any) | Basic Knowledge of Mathematics (10 th Level) | | |
| Course Learning Outcomes(CLO): | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. understand number systems, error detecting correcting code and representations of numbers in a computer system. 2. understand computer arithmetic and Boolean algebra and simplification of Boolean expressions. 3. understand working of logic gates and design various combinational circuits using these logic gates. 4. understand working of different types of flip-flops and design different types of registers. <hr style="width: 20%; margin-left: 0;"/> <p>5*. to understand the practical aspects of logical organization of computer.</p> | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |

Part B- Contents of the Course

Instructions for Paper- Setter

Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|------|---|---------------|
| I | Number Systems: Binary, Octal, Hexadecimal etc. Conversions from one number system to another, BCD Number System. BCD Codes: Natural Binary Code, Weighted Code, Self-Complimenting Code, Cyclic Code. Error Detecting and Correcting Codes. Character representations: ASCII, EBCDIC and Unicode. Number Representations: Integer numbers - sign-magnitude, 1's & 2's complement representation. Real Numbers normalized floating point representations. | 11 |
| II | Binary Arithmetic: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division using 1's and 2's Compliment representations, Addition and subtraction with BCD representations. Boolean Algebra: Boolean Algebra Postulates, basic Boolean Theorems, Boolean Expressions, Boolean Functions, Truth Tables, Canonical Representation of Boolean Expressions: SOP and POS, Simplification of Boolean Expressions using Boolean Postulates & Theorems, Karnaugh-Maps (upto four variables), Handling Don't Care conditions. | 11 |
| III | Logic Gates: Basic Logic Gates – AND, OR, NOT, Universal Gates – NAND, NOR, Other Gates – XOR, XNOR etc. Their symbols, truth tables and Boolean expressions. Combinational Circuits: Design Procedures, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers, Demultiplexers, Decoder, Encoder, Comparators, Code Converters. | 11 |
| IV | Sequential Circuits: Basic Flip- Flops and their working. Synchronous and Asynchronous Flip –Flops, Triggering of Flip-Flops, Clocked RS, D Type, JK, T type and Master-Slave Flip-Flops. State Table, State Diagram and State Equations. Flip-flops characteristics & Excitation Tables. | 12 |

| | | |
|--|--|--|
| | Sequential Circuits: Designing registers –Serial-In Serial-Out (SISO), Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO) Parallel-In Parallel-Out (PIPO) and shift registers. | |
| V* | <p>Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:</p> <p>Number System:</p> <ul style="list-style-type: none"> • Problems based on Number System and their conversion. • Programs based on Number System conversion. <p>Binary Arithmetic</p> <ul style="list-style-type: none"> • Problems based on Binary Arithmetic. • Programs based on Binary Arithmetic. • Problems based on Boolean Expression and their simplification <p>Logic Gates</p> <ul style="list-style-type: none"> • Understanding working of logic Gates. <p>Combinatorial Circuits:</p> <ul style="list-style-type: none"> • Designing and understanding various combinational circuits. <p>Sequential Circuits:</p> <ul style="list-style-type: none"> • Designing and understanding various sequential circuits. | 30 |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | | <p>End Term Examination: A three hour exam for both theory and practicum.</p> |
| Part C-Learning Resources | | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd. • V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall. • Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd. • Nicholas Carter, Schaum’s Outlines Computer Architecture, Tata McGraw-Hill. | | |

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

| Scheme: 2023-24, Syllabus: 2023-24 | | | |
|---|---|-----------|-------|
| Part A - Introduction | | | |
| Subject | BCA(AI) | | |
| Semester | I | | |
| Name of the Course | Mathematical Foundations for Computer Science-I | | |
| Course Code | B23-CAL-104 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-M1 | | |
| Level of the course (As per Annexure-I) | 100-199 | | |
| Pre-requisite for the course (if any) | | | |
| Course Learning Outcomes (CLO): | <p>After learning this course student will be able to:</p> <ol style="list-style-type: none"> 1. Gain knowledge of set theory, types of sets, and operations on sets. Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants. 2. Know the basic concepts of complex numbers and acquire skills to solve linear quadratic equations. 3. Gain the knowledge of the concepts of Arithmetic progression, Geometric progression, and Harmonic progression, and find A.M., G.M., and H.M. of given numbers. 4. Understand the concept of differentiation 5. * Attain the skills to make use of the learned concepts of Introductory Mathematics in multidisciplinary learning contexts and to know their applications | | |
| Credits | Theory | Practical | Total |
| | 1 | 1 | 2 |
| Contact Hours | 1 | 2 | 3 |

Max. Marks:50(30(T)+20(P))
Internal Assessment Marks:15(10(T)+5(P))
End Term Exam Marks:35(20(T)+15(P))

Time: 3 Hrs.(T), 3Hrs.(P)

Part B-Contents of the Course

Instructions for Paper-Setter

The examiner will set a total of nine questions. Out of which first question will be compulsory. The remaining eight questions will be set from four units, selecting two questions from each. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.

Candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|-------------|--|----------------------|
| I | Sets and their representations, Empty sets, Finite and infinite sets, Subsets, Equal sets, Power sets, Universal sets, Union and intersection of sets, Difference of two sets, Complement of a set, Venn diagram, De-Morgan's laws and their applications. | 4 |
| II | An introduction to matrices and their types, Operations on matrices, Symmetric and skew-symmetric matrices, Minors, and Co-factors. Determinant of a square matrix, Adjoint and inverse of a square matrix, Solutions of a system of linear equations up to order 3. | 4 |
| III | Quadratic equations, Solution of quadratic equations. Arithmetic progression, Geometric progression, Harmonic progression, Arithmetic mean (A.M.), Geometric mean (G.M.), Harmonic mean (H.M.), Relation between A.M., G.M. and H.M. | 3 |
| IV | The concept of differentiation, differentiation of simple functions, and Use of differentiation for solving problems related to real-life situations. Differentiation of simple algebraic, trigonometric, and exponential functions. | 4 |

| | | |
|--|--|----|
| V* | <p>Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Problem-Solving- Questions related to the practical problems based on the following topics will be worked out and a record of those will be maintained in the Practical Note Book:</p> <ul style="list-style-type: none"> • Problems related to union, intersection, difference, and complement of sets. • Problems based on De Morgan's Laws. • Problems related to Venn diagrams. • Problems to find the inverse of a matrix. • Problems to find the determinant of a square matrix of order 3. • Problems to find nth term of A.P., G.P., and H.P. • Problems to find the sum of n terms of A.P., G.P., and H.P. • Problems to find A.M., G.M., and H.M. of given numbers. • Problems involving formulation and solution of quadratic equations in one variable. • Problems to find the first derivatives of functions. | 30 |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA | <p>End Term Examination: A three-hour exam for both theory and practicum.</p> | |
| Part C-Learning Resources | | |
| <p>Text /Reference Books:</p> <ul style="list-style-type: none"> • C. Y. Young (2021). <i>Algebra and Trigonometry</i>. Wiley. • S.L. Loney (2016). <i>The Elements of Coordinate Geometry (Cartesian Coordinates)</i> (2nd Edition). G.K. Publication Private Limited. • Seymour Lipschutz and Marc Lars Lipson (2013). <i>Linear Algebra</i>. (4th Edition) Schaum's Outline Series, McGraw-Hill. • C.C. Pinter (2014). <i>A Book of Set Theory</i>. Dover Publications. • J. V. Dyke, J. Rogers and H. Adams (2011). <i>Fundamentals of Mathematics</i> (10th Edition), Brooks/Cole. • A. Tussy, R. Gustafson and D. Koenig (2010). <i>Basic Mathematics for College Students</i> (4th Edition). Brooks Cole | | |

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Scheme of Examination (3rd & 4th Semester) for Under-Graduate
Programmes

Bachelor of Computer Applications (Artificial Intelligence)
BCA (AI): SCHEME D

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based
Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted from 2023-2024)

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate Programmes
Subject: BCA (Artificial Intelligence)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships, and Choice-Based Credit System)

| Sem | Course Type | Course Code | Nomenclature of paper | Credits | Contact hours | Internal marks | End term Marks | Total Marks | Duration of exam (Hrs) T + P |
|-------|---------------------------|-------------------------------------|------------------------------------|---------|---------------|----------------|----------------|-------------|------------------------------|
| 3 | CC-A3 | B23-CAL-301 | Programming using Python | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B3 | B23-CAL-302 | Linux and Shell programming | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C3 | B23-CAL-303 | Data Base Technologies | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M3 | B23-CAL-304 | Basics of Data Science using Excel | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | MDC-3 | To be taken from another department | | | | | | | |
| | SEC-3 | To be taken from SEC Pool | | | | | | | |
| AEC-3 | To be taken from AEC Pool | | | | | | | | |
| 4 | CC-A4 | B23-CAL-401 | Data Structures and Applications | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B4 | B23-CAL-402 | Computer Networks | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |

| | | | | | | | | | |
|--|----------|---------------------------|--|---|---|----|----|----|---|
| | CC-C4 | B23-CAL-403 | Artificial Intelligence and Expert Systems | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | AEC-4 | To be taken from AEC Pool | | | | | | | |
| | VAC-3 | To be taken from VAC Pool | | | | | | | |
| | CC-M4(V) | To be taken from VOC Pool | | | | | | | |

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (3rd and 4th Semester) for Under-Graduate Programmes
BCA (Artificial Intelligence)
Scheme D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|---|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | III | | |
| Name of the Course | Programming using Python | | |
| Course Code | B23-CAL-301 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-A3 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | N.A. | | |
| Course Learning Outcomes(CLO): | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Understand the basic syntax and structure of Python programming. 2. Develop problem-solving skills using programming techniques. 3. Gain proficiency in writing, testing, and debugging Python programs. 4. Learn to work with data structures, modules, and libraries in Python. 5*. Apply Python programming to real-world scenarios and projects. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Internal Assessment Marks:30(20(T)+10(P)) | | | |
| End Term Exam Marks: 70(50(T)+20(P)) | | | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.</p> | | | |

The practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|------|---|---------------|
| I | <p>Introduction to Python: Python Overview and History, Features of Python, Difference Between C, JAVA & Python, Applications of Python, Programming Structure of Python, Python Environment Setup, Python Command Line mode and Python IDEs, Simple Python Program.</p> <p>Python Basics: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Association, Data Types, Indentation, Comments, Built-in Functions- Console Input and Console Output, Type Conversions, Python Libraries, Importing Libraries with Examples.</p> | 11 |
| II | <p>Python Control Flow: Types of Control Flow, Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statements, range () and exit () functions.</p> <p>Strings: Creating and Storing Strings, Accessing Sting Characters, the str() function, Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing, Format Specifies, Escape Sequences, Raw and Unicode Strings, Python String Methods.</p> <p>Lists: Creating Lists, Operations on Lists, Built-in Functions on Lists, and Implementation of Stacks and Queues using Lists and nested Lists.</p> | 11 |
| III | <p>Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.</p> <p>Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods</p> <p>Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key-Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions.</p> | 12 |
| IV | <p>File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.</p> | 11 |

| | | |
|--|---|----|
| V* | <p>Practicum:</p> <p>Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> • Write a program that takes two integers as command line arguments and prints the sum of two integers. • Program to display the information: • Your name, Full Address, Mobile Number, College Name, Course Subjects • Program to find the largest number among 'n' given numbers. • Program to find the sum of all prime numbers between 1 and 1000. • Program that reads a set of integers and displays the first and second largest numbers. • Program to print the sum of first 'n' natural numbers. • Program to find the product of two matrices. • Program to find the roots of a quadratic equation • Write both recursive and non-recursive functions for the following: • To find the GCD of two integers • To find the factorial of the positive integer • To print the Fibonacci Sequence up to the given number 'n' • Program that accepts a string as an argument and returns the number of vowels and consonants the string contains. • Program that accepts two strings S1, S2, and finds whether they are equal are not. • Program to count the number of occurrences of characters in a given string. • Program to find whether a given string is palindrome or not. • Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pairwise sums of the numbers in L1 and L2. • Program to read the lists of numbers as L1, and print the lists in reverse order without using reverse function. • Write a program that combine lists L1 and L2 into a dictionary • Program to find all duplicates in the list. • Program to find all the unique elements of a list. • Program to find the max and min of a given tuple of integers. • Program to find union, intersection, difference, symmetric difference of given two sets. | 30 |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA | <p>End-Term Examination:</p> <p>A three-hour exam for both theory and practicum.</p> <p>End Term Exam Marks:</p> | |

| | |
|---|------------------------|
| <ul style="list-style-type: none"> • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | 70(50(T)+20(P)) |
| Part C-Learning Resources | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Think Python How to Think Like a Computer Scientist, Allen Downey, et al., 2nd Edition, Green Tea Press. Freely available online @https://www.greenteapress.com/thinkpython/thinkCSpy.pdf. • Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019. • Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012. | |

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|---|---|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | III | | |
| Name of the Course | Linux and Shell Programming | | |
| Course Code | B23-CAL-302 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-B3 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Must have basic knowledge of computer | | |
| Course Learning Outcomes(CLO): | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. understand Linux architecture. 2 use various Linux commands that are used to manipulate system operations. 3 acquire knowledge of Linux File System. 4 understand and make effective use of I/O and shell scripting language to solve problems. <hr style="width: 20%; margin-left: 0;"/> <p>5*. to implement the programs based on various shell commands and programs in Linux.</p> | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Internal Assessment Marks:30(20(T)+10(P)) | | | |
| End Term Exam Marks: 70(50(T)+20(P)) | | | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit.</p> | | | |

The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Introduction to Linux: Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, Logging in and Logging out, Comparison of Linux with other operating systems. | 11 |
| II | Commands in Linux: General-purpose commands, File oriented commands, directory-oriented commands, Communication-oriented commands, process-oriented commands, etc. Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, grep; Introducing regular expressions. | 11 |
| III | Linux file system: Linux files, inodes and structure and file system, file system components, standard file system, file system types. Processes in Linux: Starting and Stopping Processes, Initialization Processes, Mechanism of process creation, and Job control in Linux using at, batch, cron & time. | 11 |
| IV | Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux. | 12 |
| V* | Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: <ul style="list-style-type: none"> • Basic Linux command • Basic Shell Programming (Fibonacci Series generation, Factorial of a given number, Checking for Armstrong number) • Designing an Arithmetic calculator • Generation of Multiplication table • Base Conversion (Decimal to Binary, Binary to Decimal) • Finding the information about the Login name and File name. • Write a shell script to exchange the contents of two variables. • Write a shell script, which accepts three subject marks scored by a student and declares the result. • Write a shell script program to find the area of a square, rectangle, circle, and triangle. • Write a shell script to print integer numbers from 1 to 20. | 30 |
| Suggested Evaluation Methods | | |
| Internal Assessment: ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 | | End Term Examination: A three-hour exam for both theory and |

| | |
|---|-------------------|
| <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | <p>practicum.</p> |
| <p>Part C-Learning Resources</p> | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Yashwant Kanetkar, Unix & Shell programming – BPB Publications. • Richard Petersen, The Complete Reference – Linux, McGraw-Hill. • M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education. • Stephen Prata, Advanced UNIX-A Programmer’s Guide, SAMS Publication. • Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill. | |

*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | III | | |
| Name of the Course | Data Base Technologies | | |
| Course Code | B23-CAL-303 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-C3 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Basic Knowledge of computer | | |
| Course Learning Outcomes(CLO): | After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. understand the basic concepts and structure of database technologies 2. understand the various models used in the database 3. understand various ways to manipulate the data in the database 4. understand the relational model and data representation in a structured manner. <hr style="width: 20%; margin-left: 0;"/> 5*. to perform various operations on databases. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. | | | |

The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|------|---|---------------|
| I | <p>Basic Concepts – Data, Information, Records, Files, Schema and Instance etc. Limitations of File-Based Approach, Characteristics of Database Approach, Database Management System (DBMS), Components of DBMS Environment, DBMS Functions and Components, Database Interfaces, Advantages and Disadvantages of DBMS.</p> <p>Database Users: Data and Database Administrator, Role and Responsibilities of Database Administrator, Database Designers, Application Developers etc. Database System Architecture – 1-Tier, 2-Tier & Three Levels of Architecture, External, Conceptual, and Internal Levels, Schemas, Mappings and Instances, Data Independence – Logical and Physical Data Independence.</p> | 11 |
| II | <p>Data Models: Hierarchical, Network, and Relational Data Models.</p> <p>Entity-Relationship Model: Entity, Entity Sets, Entity Type, Attributes: Type of Attributes, Keys, Integrity Constraints, Designing of ER Diagram, Symbolic Notations for Designing ER Diagram,</p> | 11 |
| III | <p>SQL: Meaning, Purpose and Need of SQL, Data Types, SQL Components: DDL, DML, DCL and DQL, Basic Queries, Joint Operations and Sub-queries. Constraints and its Implementation in SQL.</p> <p>Relational Algebra: Basic Operations: Select, Project, Join, Union, Intersection, Difference, and Cartesian Product, etc.</p> <p>Relational Calculus: Tuple Relational and Domain Relational Calculus.</p> | 12 |
| IV | <p>Relational Model: Functional Dependency, Characteristics, Inference Rules for Functional Dependency, Types of Functional Dependency,</p> <p>Normalization: Benefits and Need of Normalization, Normal Forms Based on Primary Keys- (1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF, Domain Key Normal Form.</p> | 11 |
| V* | <p>The following activities be carried out/ discussed in the lab during the period of the semester.</p> <p>Programming Lab:</p> <ul style="list-style-type: none"> • Performing various SQL statements. Creating various tables and performing all possible queries based on the syllabus. • Creating and populating a simple database, performing basic CRUD operations. | 30 |

| | | |
|---|---|--|
| | <ul style="list-style-type: none"> • Writing complex queries involving joins subqueries, and using indexes. • Understanding relational model concepts • Understanding normalization • Designing a database schema for a given problem, and normalization of the schema. | |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | <p>End Term Examination: A three-hour exam for both theory and practicum.</p> | |
| Part C-Learning Resources | | |
| <p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education. • A Silberschatz, H Korth, S Sudarshan, Database System and Concepts, McGraw-Hill. • Thomas Connolly Carolyn Begg, Database Systems, Pearson Education. • C. J. Date, An Introduction to Database Systems, Addison Wesley. | | |

*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|---|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | III | | |
| Name of the Course | Basics of Data Science using Excel | | |
| Course Code | B23-CAL-304 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-M3 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Basic knowledge of mathematics and computer | | |
| Course Learning Outcomes(CLO): | <p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. understand the fundamental concepts of data science and the role of Excel in data analysis. 2. learn data cleaning, preparation, and visualization techniques using Excel. 3. apply statistical analysis and predictive modeling using Excel. 4. To explore advanced Excel functions and data analysis tools. <hr style="width: 50%; margin-left: 0;"/> <p>5*. Implement the various functions in Excel</p> | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Internal Assessment Marks:30(20(T)+10(P)) | | | |
| End Term Exam Marks: 70(50(T)+20(P)) | | | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal</p> | | | |

marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|------|---|---------------|
| I | Introduction to Data Science: Definition, importance, and applications. Overview of Excel: Interface, basic functions, and features. Data Types and Formats in Excel: Text, numbers, dates, and custom formats. Basic Data Manipulation: Sorting, filtering, and basic formulas (SUM, AVERAGE, COUNT). | 11 |
| II | Data Import and Export: CSV, TXT, and Excel files. Data Cleaning Techniques: Handling missing values, duplicates, and errors. Data Transformation: Text-to-columns, concatenation, and data validation. Data Visualization: Creating and customizing charts (bar, line, pie). | 11 |
| III | Descriptive Statistics: Mean, median, mode, standard deviation, and variance. Inferential Statistics: Hypothesis testing, t-tests, and chi-square tests. Regression Analysis: Simple linear regression and multiple regression. Predictive Modeling: Introduction to basic predictive models and their implementation in Excel. | 11 |
| IV | Advanced Excel Functions: VLOOKUP, HLOOKUP, INDEX-MATCH, and PivotTables. Data Analysis ToolPak: Using Excel's built-in data analysis tools such as Descriptive Statistics, Histograms, Correlation, and Regression. What-If Analysis Tools: Scenario Manager, Goal Seek, and Data Tables. | 12 |
| V* | <p>The following activities will be carried out/ discussed in the lab during the semester.</p> <p>Familiarize with Excel interface and basic operations.</p> <ul style="list-style-type: none"> • Explore Excel ribbons, toolbars, and interface. • Practice data entry, formatting, and basic calculations. • Create a simple spreadsheet and perform basic functions. <p>Import data and perform basic cleaning tasks.</p> <ul style="list-style-type: none"> • Import datasets from CSV and text files. • Identify and handle missing values. • Remove duplicates and correct data errors. <p>Manipulate data through sorting and filtering.</p> <ul style="list-style-type: none"> • Apply sorting to datasets based on different criteria. • Use filters to analyze subsets of data. • Create custom filters to extract specific data points. <p>Utilize formulas for data transformation.</p> <ul style="list-style-type: none"> • Practice text functions: LEFT, RIGHT, MID, | 30 |

| | | |
|--|---|--|
| | <p>CONCATENATE.</p> <ul style="list-style-type: none"> • Use date functions: TODAY, DATE, DATEDIF. • Implement basic mathematical formulas: SUM, AVERAGE, COUNT. <p>Calculate and interpret descriptive statistics.</p> <ul style="list-style-type: none"> • Calculate measures of central tendency: mean, median, mode. • Compute measures of dispersion: range, variance, standard deviation. • Use built-in Excel functions for statistical analysis. <p>Apply conditional formulas and formatting.</p> <ul style="list-style-type: none"> • Use IF, SUMIF, and COUNTIF functions for conditional analysis. • Apply conditional formatting to highlight data trends and anomalies. • Create data-based rules for formatting. <p>Create and customize basic charts and graphs.</p> <ul style="list-style-type: none"> • Generate line charts, bar charts, and pie charts. • Customize chart elements: titles, labels, and legends. • Analyse data visually through chart types. <p>Summarize data using PivotTables.</p> <ul style="list-style-type: none"> • Create PivotTables to aggregate data. • Group data and create custom summaries. • Utilize slicers to filter and analyze PivotTable data interactively. <p>Apply lookup and reference functions.</p> <ul style="list-style-type: none"> • Use VLOOKUP and HLOOKUP for data retrieval. • Implement INDEX and MATCH functions for advanced lookups. • Practice using the OFFSET function for dynamic data ranges. <p>Perform statistical analysis using the Data Analysis Toolpak.</p> <ul style="list-style-type: none"> • Install and activate the Data Analysis Toolpak. • Conduct regression analysis and ANOVA. • Explore other statistical tests available in the Toolpak. | |
| Suggested Evaluation Methods | | |
| <p>Internal Assessment:</p> <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | <p>End Term Examination: A three hour exam for both theory and practicum.</p> | |
| Part C-Learning Resources | | |
| Recommended Books/e-resources/LMS: | | |

- "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett.
- "Excel Data Analysis: Modeling and Simulation" by Hector Guerrero.
- "Data Analysis Using Microsoft Excel" by Michael R. Middleton.
- "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach.
- "Practical Statistics for Data Scientists: 50 Essential Concepts" by Peter Bruce and Andrew Bruce.

*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | IV | | |
| Name of the Course | Data Structures and Applications | | |
| Course Code | B23-CAL-401 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-A4 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Knowledge of any Computer Programming Language | | |
| Course Learning Outcomes(CLO): | After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. learn the basics of data structure and algorithm complexities. 2. acquire knowledge of arrays and strings. 3. understand the idea of implementation for linked lists and stacks. 4. learn various searching and sorting techniques along with the implementation of queues. 5* develop the project with data structures. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Internal Assessment Marks:30(20(T)+10(P)) | | | |
| End Term Exam Marks: 70(50(T)+20(P)) | | | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.</p> <p>The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.</p> | | | |

| Unit | Topics | Contact Hours |
|------|---|---------------|
| I | <p>Data Structure Definition, Data Type vs. Data Structure, Classification of Data Structures, Data Structure Operations, Applications of Data Structures.</p> <p>Algorithm Specifications: Performance Analysis and Measurement (Time and Space Analysis of Algorithms- Average, Best and Worst Case Analysis).</p> <p>Arrays: Introduction, Linear Arrays, Representation of Linear Array in Memory, Two Dimensional and Multidimensional Arrays, Sparse Matrix and its Representation, Operations on Array: Algorithm for Traversal, Selection, Insertion, Deletion and its implementation.</p> | 11 |
| II | <p>String Handling: Storage of Strings, Operations on Strings viz., Length, Concatenation, Substring, Insertion, Deletion, Replacement, Pattern Matching</p> <p>Linked List: Introduction, Array vs. linked list, Representation of linked lists in Memory, Traversing a Linked List, Insertion, Deletion, Searching into a Linked list, Type of Linked List.</p> | 11 |
| III | <p>Stack: Array Representation of Stack, Linked List Representation of Stack, Algorithms for Push and Pop, Application of Stack: Polish Notation, Postfix Evaluation Algorithms, Infix to Postfix Conversion, Infix to Prefix Conversion, Recursion.</p> <p>Introduction to Queues: Simple Queue, Double Ended Queue, Circular Queue, Priority Queue, Representation of Queues as Linked List and Array, Applications of Queue. Algorithm on Insertion and Deletion in Simple Queue and Circular Queue. Priority Queues.</p> | 12 |
| IV | <p>Tree: Definitions and Concepts, Representation of Binary Tree, Binary Tree Traversal (Inorder, postorder, preorder), Binary Search Trees – Definition, Operations viz., searching, insertions and deletion;</p> <p>Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching.</p> | 11 |
| V* | <p>Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> • Write a program that uses functions to perform the following operations on an array i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on strings i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal • Write a program that implement stack (its operations) using | 30 |

| | | |
|--|--|--|
| | i) Arrays ii) Linked list(Pointers). <ul style="list-style-type: none"> • Write a program that implements Queue (its operations) using i) Arrays and ii) Linked lists (Pointers). • Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort. • Write programs for various types of tree traversals. | |
| Suggested Evaluation Methods | | |
| Internal Assessment: <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P)) | |
| Part C-Learning Resources | | |
| Recommended Books/e-resources/LMS: <ul style="list-style-type: none"> • Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines. • Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures Using C, Pearson Education. • Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw-Hill. • Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley. <p>* Applicable for courses having practical components.</p> | | |

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | IV | | |
| Name of the Course | Computer Networks | | |
| Course Code | B23-CAL-402 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-B4 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Basic understanding of computer systems and programming. | | |
| Course Learning Outcomes(CLO): | After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. understand the fundamental concepts of computer networks. 2. learn about network protocols, architectures, and applications. 3. develop skills for designing and managing networks. 4. learn about security aspects along with wireless networks. 5*. Understand the practical aspects of computer networks. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Internal Assessment Marks:30(20(T)+10(P)) | | | |
| End Term Exam Marks: 70(50(T)+20(P)) | | | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.</p> | | | |

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|---|--|---|
| I | Introduction to Computer Networks: Overview of computer networks, types of networks (LAN, WAN, MAN), network topologies, and network models (OSI and TCP/IP). Physical Layer: Data transmission methods, signal encoding techniques, transmission media, and network devices (hubs, switches, routers). | 11 |
| II | Data Link Layer: Error detection and correction, flow control, MAC protocols, Ethernet, and switching. Network Layer: IP addressing and subnetting, routing algorithms, IPv4 vs. IPv6, and ARP. | 11 |
| III | Transport Layer: Transport layer protocols (TCP, UDP), congestion control, and quality of service (QoS). Application Layer: Application layer protocols (HTTP, FTP, DNS, SMTP), web services, and network applications. | 11 |
| IV | Network Security: Fundamentals of network security, cryptography, firewalls, VPNs, and intrusion detection systems (IDS). Wireless Networks: Wireless communication principles, Wi-Fi, Bluetooth, mobile networks, and ad hoc networks. | 12 |
| V* | Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: <ul style="list-style-type: none"> • Setting up a basic LAN • Implementing error detection and correction algorithms. • Analyzing signal encoding techniques • Configuring routers and switches, subnetting exercises. • Implementing and analyzing TCP and UDP protocols. • Developing simple client-server applications. • Setting up and configuring firewalls and VPNs. • Setting up and securing a wireless network. | 30 |
| Suggested Evaluation Methods | | |
| Internal Assessment: <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | | End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P)) |
| Part C-Learning Resources | | |

Recommended Books/e-resources/LMS:

- "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
- "Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall.
- "Data and Computer Communications" by William Stallings.
- "Network Security Essentials" by William Stallings.

*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

| Scheme: 2024-25, Syllabus: 2024-25 | | | |
|--|--|----------------------------------|-------|
| Part A - Introduction | | | |
| Subject | BCA (Artificial Intelligence) | | |
| Semester | IV | | |
| Name of the Course | Artificial Intelligence and Expert Systems | | |
| Course Code | B23-CAL-403 | | |
| Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC) | CC-C3 | | |
| Level of the course (As per Annexure-I) | 200-299 | | |
| Pre-requisite for the course (if any) | Basic understanding of computer systems and programming. | | |
| Course Learning Outcomes(CLO): | After completing this course, the learner will be able to: 1. Understand core principles and techniques of AI and expert systems. 2. Learn and implement AI algorithms and expert system methodologies. 3. Develop practical skills in creating and evaluating expert systems. 4. Discuss ethical considerations and societal impacts of AI and expert systems. 5*. Apply AI techniques to solve real-world problems. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P)) | | Time: 3 Hrs.(T), 3Hrs.(P) | |
| Part B- Contents of the Course | | | |
| <u>Instructions for Paper-Setter</u> | | | |
| <p>The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.</p> | | | |

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Introduction to Artificial Intelligence: Overview of AI; History; Applications; Terminology Problem-Solving and Search Algorithms: Problem-solving as search; Uninformed search strategies (BFS, DFS); Informed search strategies (A*) | 11 |
| II | Adversarial Search and Game Playing: Game theory basics; Minimax algorithm; Alpha-beta pruning Knowledge Representation and Reasoning: Logical agents; Propositional logic; First-order logic; Inference mechanisms | 11 |
| III | Expert Systems Fundamentals: Introduction to expert systems; Components; Knowledge representation; Inference engines Knowledge Acquisition and Management: Techniques for knowledge acquisition; Knowledge management; Ontologies | 11 |
| IV | Ethics and Social Impacts of AI and Expert Systems: Ethical considerations; Bias and fairness; Societal impact of AI and expert systems Case Studies in Expert Systems: Case studies of successful expert systems in various domains (e.g., medical diagnosis, financial forecasting) | 12 |
| V* | Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: <ul style="list-style-type: none"> • Exercises on BFS, DFS, and A* algorithms • Implementing Minimax and Alpha-beta pruning algorithms • Exercises on propositional and first-order logic • Exercises on building and implementing rule-based expert systems • Using tools for knowledge management and acquisition • Analyzing case studies and extracting design principles • Group discussions and presentations on case studies • Analysis and discussion of ethical issues related to AI and expert systems | 30 |
| Suggested Evaluation Methods | | |
| Internal Assessment: <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA | | End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P)) |

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
- "Expert Systems: Principles and Programming" by Joseph C. Giarratano and Gary D. Riley

*Applicable for courses having practical components.