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 (5th & 6th Semester) for Under-Graduate Programmes
Bachelor of Computer Applications (BCA)
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)

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	V		
Name of the Course	Software Engineering		
Course Code	B23-CAP-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Programming language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the various models for software development. 2. understand how to analyze software. 3. plan a software design and the risks associated with software. 4. test and validate software 5*. Implement the various tools and techniques used in software engineering.		
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			
The 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. 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. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

Unit	Topics	Contact Hours
	three-hour duration.	
I	Introduction: Program vs. Software, Software Engineering, Programming paradigms, Software Crisis – problem and causes, Phases in Software development: Requirement Analysis, Software Design, Coding, Testing, Maintenance, Software Development Process Models: Waterfall, Prototype, Evolutionary and Spiral models, Role of Metrics.	11
II	Feasibility Study, Software Requirement Analysis and Specifications: SRS, Need for SRS, Characteristics of an SRS, Components of an SRS, Problem Analysis, Information gathering tools, Requirement specification, validation and metrics. Structured Analysis and Tools: Data Flow Diagram, Data Dictionary, Decision table, Decision trees, Structured English, Entity-Relationship diagrams	11
III	Software Project Planning: Cost estimation: COCOMO model, Project scheduling, Staffing, and personnel planning, team structure, Software configuration management, Quality assurance plans, Project monitoring plans, Risk Management. Software Design: Design fundamentals, problem partitioning, and abstraction, design methodology, Cohesion & Coupling.	12
IV	Software testing strategies: unit testing, integration testing, Validation testing, System testing, Alpha and Beta testing. Software Maintenance: Type of maintenance, Management of Maintenance, Maintenance Process, maintenance characteristics.	11

V*	Practicum:
	 Students are advised to do laboratory/practical practice not limited to but including the following types of problems:
	• Development of 0-level DFD
	• Development of 1 level DFD
	• Development of 2-level DFD
	• data dictionary,
	• E-R diagram for Student Teacher Relationship
	• E-R diagram for Library Management,
	• Draw an ER Diagram for the Hospital Management System.
	• ER diagram for (ANY 5)
	   • Student Result Management System
	   • Library management system
	   • Inventory control system
	   • Accounting system
	   • Fast food billing system
	   • Bank loan system
	   • Blood bank system
	   • Railway reservation system
	   • Automatic teller machine
	   • Video library management system
	   • Hotel management system
	   • Hostel management system
		30

	• E-ticking • Share online trading • Hostel management system • Resource management system • Court case management system	
Suggested Evaluation Methods		

Internal Assessment:
➢ **Theory**
  • Class Participation: 5
  • Seminar/presentation/assignment/quiz/class test etc.: 5
  • Mid-Term Exam: 10
 	
➢ **Practicum**
  • 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: • Pressman R. S., "Software Engineering – A Practitioner's Approach", Tata McGraw Hill. • Jalote P., "An Integrated Approach to Software Engineering", Narosa. • Sommerville, "Software Engineering", Addison Wesley. • Fairley R., "Software Engineering Concepts", Tata McGraw Hill. • James Peter, W Pedrycz, "Software Engineering", John Wiley & Sons.		

*Applicable for courses having practical components.

Scheme: 2023-24, Syllabus: 2024-25	
Part A - Introduction	
Subject	BCA
Semester	V
Name of the Course	Back-end Development
Course Code	B23-CAP-502
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5
Level of the course (As per Annexure-I	300-399
Pre-requisite for the course (if any)	B23-CAP-202
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the principles of back-end development. 2. Gain proficiency in back-end programming languages and frameworks. 3. Learn to design and manage databases. 4. Develop skills to create and use back-end applications. _____ 5*. to equip with the knowledge of back-end programming.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks:75(50(T)+25(P)) **Internal Assessment Marks:20(15(T)+5(P))** **End Term Exam Marks: 55(35(T)+20(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 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.

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 back-end Development:** Overview of backend, Client-server architecture, Introduction to web servers and database **Programming Languages and Tools:** Introduction to server-side languages (e.g., Node.js), Syntax and semantics of chosen server-side language	11
II	**Programming Languages:** Version control with Git, Introduction to IDEs (Integrated Development Environments) of chosen language, Writing and executing basic server-side scripts **Performance Optimization and Security:** Caching strategies, Query optimization	11
III	**Database Management:** Introduction to databases and DBMS (SQL and NoSQL), Designing a database schema, CRUD operations (Create, Read, Update, Delete), Connecting applications to a database	11
IV	**Server-Side Frameworks:** Overview of popular server-side frameworks (e.g., Express.js), Building a simple application using a framework. **API Development:** RESTful API concepts, Designing and documenting APIs, Authentication and authorization basics Web security best practices (SQL injection, XSS, CSRF)	12

V*	The following activities be carried out/ discussed in the lab during the initial period of the semester.
	Programming Lab:
	• Introduction to Backend Technologies: Objective: Familiarize students with backend technologies and tools.
	   o Setup development environment (e.g., IDE, Git).
	   o Create a simple "Hello World" backend application in Node.js.
	• Working with Databases (SQL): Objective: Learn basic SQL operations and database interactions.
	   o Set up MySQL/PostgreSQL database.
	   o Perform CRUD operations using SQL queries (Create, Read, Update, Delete).
	• Working with NoSQL Databases: Objective: Introduce students to NoSQL databases.
	   o Set up MongoDB database.
	   o Implement CRUD operations using NoSQL commands.
	• Building RESTful APIs: Objective: Develop skills in designing and implementing RESTful APIs.
	   o Create endpoints for CRUD operations.
		30

	- o Implement basic authentication and authorization. - Web Frameworks (Choose one: Node.js or Express.js): Objective: Gain practical experience with backend frameworks. - o Setup Node.js/Express.js project. - o Implement a simple web application (Express.js or Node.js). - Integrating Frontend and Backend: Objective: Understand frontend-backend interaction. - o Create API endpoints to serve JSON data. - o Develop a frontend (HTML/CSS/JavaScript) to consume backend API. - Data Validation and Error Handling: Objective: Learn techniques for validating input data and handling errors. - o Implement input validation using middleware (Express.js) or Node.js forms. - o Handle errors and exceptions gracefully. - Security Best Practices: Objective: Implement security measures in backend applications. - o Implement HTTPS/SSL configuration. - o Prevent common security vulnerabilities (e.g., SQL injection, XSS).	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➢ **Practicum** • 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.**

Part C-Learning Resources

Recommended Books/e-resources/LMS:
- "Node.js Design Patterns" by Mario Casciaro and Luciano Mammino
- "Learning PHP, MySQL & JavaScript" by Robin Nixon
- Online documentation and tutorials for the chosen programming language and frameworks
- "Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin
- "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and
- Maintainable Systems" by Martin Kleppmann
- "SQL Cookbook: Query Solutions and Techniques for Database Developers" by Anthony Molinaro
- "High-Performance Browser Networking: What every web developer should know about networking and web performance" by Ilya Grigorik

*Applicable for courses having practical component.

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	V		
Name of the Course	Network Infrastructure and Data Communication Technologies		
Course Code	B23-CAP-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-C5		
Level of the course (As per Annexure-I	300-399		
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: 1. Understand the basic concepts and principles of computer networks. 2. Describe the analog and digital communication concepts. 3. Evaluate different data link layer designs and LAN technologies. 4. Analyze the various routing algorithms and know about the application layer. 5*. Use networking infrastructure and its applications.		
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)**	
Instructions for Paper-Setter			
The 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. 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 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.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction to Data Communication and Computer Networks; Uses of Computer Networks; Types of Computer Networks and their Topologies; Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways; Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; OSI Reference Model; TCP/IP Model	11
II	Analog and Digital Communications Concepts: Analog and Digital data and signals; Bandwidth and Data Rate, Capacity, Baud Rate; Guided and Wireless Transmission Media; Communication Satellites; Switching and Multiplexing; Modems and modulation techniques	11
III	Data Link Layer Design issues; Error Detection and Correction methods; Sliding Window Protocols: One-bit, Go Back N, and Selective Repeat; Media Access Control: ALOHA, Slotted ALOHA, CSMA, Collision free protocols; Introduction to LAN technologies: Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet; Token Ring; Introduction to Wireless LANs and Bluetooth;	11
IV	Routing Algorithms: Flooding, Shortest Path Routing, Distance Vector Routing; Link State Routing, Hierarchical Routing; Congestion Control; Traffic shaping; Choke packets; Load shedding; Application Layer: Introduction to DNS, E-Mail, and WWW services; Network Security Issues: Security attacks; Encryption methods; Firewalls; Digital Signatures;	12
V*	The following activities be carried out/ discussed in the labduring the semester. Programming Lab: - Experiment Study of different types of Network cables and Practically implement the cross-wired cable and straight-through cable using a clamping tool. - Study of Network Devices in Detail. - Study of network IP. - Connect the computers to the Local Area Network. - Performing an Initial Switch Configuration Performing an Initial Router Configuration - To study about components and specifications of Laptops and Desktop. - Familiarization with networking components and devices LAN adapter, Hub, Switches, Routers, etc. - Familiarization with Transmission media and tools: Co-axial cable, UTP cable, Crimping tool, Connectors, etc. - Introduction to various interior and exterior routing protocols. - Study of various LAN topologies and their creation using network devices, cables, and Computer. - Configuration of TCP/IP protocols in Window/LINUX.	30

Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • 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: • Andrew S. Tanenbaum, "Computer Networks", Pearson Education. • Michael A. Gallo, William M. Hancock, "Computer Communications and Networking Technologies", CENGAGE Learning. • Behrouz A Forouzan, "Data Communications and Networking", McGraw Hill.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26	
Part A – Introduction	
Subject	Computer Science
Semester	III
Name of the Course	Computer Hardware Maintenance
Course Code	B23-VOC-107
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC
Level of the course (As per Annexure-I	200-299
Pre-requisite for the course (if any)	
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Identify and describe the key hardware components of a computer system. 2. Assemble a fully functional desktop computer from individual parts. 3. Diagnose and troubleshoot common hardware and software issues. 4. Install and configure operating systems and drivers. 5. Perform routine maintenance and basic upgrades on PCs.

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
The 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. 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. 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	**Fundamentals of Computer Hardware**: Types of computer systems, Evolution of computers, Overview of hardware vs software, Motherboard types and form factors, Chipsets and buses (PCI, SATA, USB)	11
II	**Components and Peripherals:** Central Processing Unit (CPU), RAM types and installation, SMPS and connectors, Storage devices (HDD, SSD, NVMe), Input/output devices and ports, BIOS/UEFI basics and configuration	11
III	**PC Assembly Process:** Precautions and safety (ESD), Tools for assembly, Mounting motherboard and processor, Installing RAM and storage, Connecting power supply, POST check, BIOS setup and boot configuration	11
IV	**Troubleshooting and Maintenance:** Common hardware problems and symptoms, Boot errors and diagnostic tools, Software troubleshooting (BSOD, driver issues, malware), Preventive maintenance, Upgrading RAM, storage, and GPU	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Identifying and handling PC components (RAM, CPU, PSU, HDD) 2. Disassembling and reassembling a desktop PC 3. Configuring BIOS/UEFI settings 4. Installing an operating system (Windows/Linux) 5. Installing device drivers and basic utilities 6. Formatting and partitioning storage drives 7. Creating dual-boot and using virtualization 8. Simulating and diagnosing hardware faults 9. Troubleshooting slow systems and driver issues 10. Running antivirus scans and clean-up tools 11. Upgrading components (RAM, SSD/HDD) 12. Backing up and restoring system data	30

Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • 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:

- **Scott Mueller**, *Upgrading and Repairing PCs*, Pearson Education, Latest Edition
- **Jean Andrews**, *A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting*, Cengage Learning, Latest Edition
- **K.L. James**, *Computer Hardware and Maintenance*, PHI Learning
- **Michael Meyers**, *CompTIA A+ Certification All-in-One Exam Guide*, McGraw-Hill Education
- **Balaji Srinivasan**, *Troubleshooting, Maintaining and Repairing PCs*, Pearson Education

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25	
Part A - Introduction	
Subject	BCA
Semester	VI
Name of the Course	Programming using Python
Course Code	B23-CAP-601
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6
Level of the course (As per Annexure-I	300-399
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: 1. understand the basic concepts of Python programming 2. learn various data structures used in Python programming. 3. develop the simple programs of Python using arrays and functions. 4. illustrate the process of data file manipulations using python 5* develop the programs using Python.

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

The 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	Introduction to Python: Python Interpreter, Python as calculator, Python shell, Indentation, identifier and keywords, literals, strings, Operators: Arithmetic, Relational, Logical, comparison, Bitwise, Assignment, Identity operator and Membership operator; Input & output statements; Control statements: Branching, looping, Conditional statement, Exit function	11
II	String Manipulations: Subscript operator, indexing, slicing a string, other functions on strings, string module. Strings and number system: Format functions, converting strings to numbers & Vice Versa. List, Tuples, Sets, Dictionaries: Basic list operators, replacing, inserting, removing an element, searching, Sorting lists, dictionary literals, adding & removing keys, accessing & replacing values, traversing dictionaries.	11
III	Array in Python, Design with Functions: hiding redundancy, complexity, arguments & return values; Formal/Actual arguments, named arguments, program structure and design, Recursive functions, scope & Global statements, Importing modules, Math modules & Random modules.	11
IV	Exception Handling: Exceptions, except clause, try and finally clause, user-defined exceptions. File Handling: Manipulating files & directories, OS & SYS modules, Reading, writing text & numbers from/to file. Graphics: "Turtle" module, drawing colors, shapes, digital images, image file formats.	12
V*	**Practicum**: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • WAP to find the roots of a quadratic equation. • WAP to accept a number 'n' and (a). Check if 'n' is prime (b). Generate all prime numbers till 'n' (c). Generate first 'n' prime numbers (d). This program may be done using functions. • WAP that accepts a character and performs the following: (a). print whether the character is a letter, numeric digit, or special character (b). if the character is a letter, print whether the letter is uppercase or lowercase (c). if the character is a numeric digit, print its name in the text (e.g., if the input is 9, the output is NINE) • WAP to perform the following operations on a string (a). Find the frequency of a character in a string. (b). Replace a character by another character in a string. (c). Remove the first occurrence of a character from a string. (d). Remove all occurrences of a character from a string. • WAP to swap the first n characters of two strings. • Write a function that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1. • WAP to create a list of the cubes of only the even integers appearing in the input list (may have elements of other types also) using the following: (a). 'for' loop (b). list comprehension	30

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- WAP to read a file and (a). Print the total number of characters, words, and lines in the file. (b). Calculate the frequency of each character in the file. Use a variable of dictionary type to maintain the count. (c). Print the words in reverse order. (d). Copy even lines of the file to a file named 'File1' and odd lines to another file named 'File2'.
- Write a function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys.
- Consider a tuple t1= (1, 2, 5, 7, 9, 2, 4, 6, 8, 10). WAP to perform the following operations: (a). Print half the values of the tuple in one line and the other half in the next line. (b). Print another tuple whose values are even numbers in the given tuple. (c). Concatenate a tuple t2= (11,13,15) with t1. (d). Return maximum and minimum values from this tuple
- WAP to accept a name from a user. Raise and handle the appropriate exception(s) if the text entered by the user contains digits and/or special characters.

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • 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:
- Sheetal Taneja, Naveen Kumar, Python Programming: A Modular approach, 5th Impression, Pearson.
- Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press.
- Mark Lutz, Learning Python (available online at pdf derive).
- Guttag John V, Introduction to Computation and Programming Using Python with Application to Understanding Data, PHI.
- Charles Diorbach, Introduction to Computer Science using Python, Wiley.
- Balaguruswamy E., Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018.
- Brown, Martin C., Python: The Complete Reference, 2nd edition, McGraw Hill Education, 2018.

* Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	VI		
Name of the Course	Advanced Web Development		
Course Code	B23-CAP-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	B23-CAP-202, B23-CAP-402, B23-CAP-502		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. gain proficiency in advanced web development frameworks and tools. 2. understand the principles of responsive design and progressive web apps. 3. learn best practices for database management and full-stack development. 4. know about optimization and devops. 5* To work on real-world projects and develop a comprehensive web application.		
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.			

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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. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	**Advanced Front-End Development:** Advanced HTML5 & CSS3: Semantic HTML, CSS Grid and Flexbox, CSS Preprocessors (Sass/LESS) JavaScript ES6+: Advanced JavaScript concepts (Promises, Async/Await), ES6+ features (Arrow functions, Template literals, Destructuring)	11
II	Front-End Frameworks: Introduction to React, Angular, Component-based architecture, State management with Redux **Advanced Back-End Development:** Server-Side Programming: Express.js, GraphQL, Middleware, and Authentication (JWT, OAuth)	11
III	Database Management: Advanced SQL concepts, NoSQL databases (Firebase), ORMs (Sequelize) **Full-Stack Development:** Integrating Front-End and Back-End: Building a full-stack application, Handling asynchronous operations, Real-time applications with WebSockets	11
IV	**Performance Optimization**: Code splitting and lazy loading, Caching strategies, Optimizing images and assets **Deployment and DevOps:** Deployment Strategies: CI/CD pipelines, Containerization with Docker, Deployment platforms (Heroku, AWS, Netlify) DevOps and Monitoring: Infrastructure as code (Terraform, Ansible), Monitoring and logging (Prometheus, Grafana)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • **Front-End Projects:** Develop a responsive web application using React/Angular. • **Back-End Projects:** Build and deploy a RESTful API using Node.js and Express.js. • **Full-Stack Projects:** Create a full-stack application integrating front-end and back-end. • **Optimization Projects:** Implement performance optimization techniques on existing projects. • **Deployment Projects:** Set up a CI/CD pipeline and deploy a web application to a cloud platform.	30
Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory** • Class Participation: 5		**End Term Examination:** A three-hour

• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum.

Part C-Learning Resources

Recommended Books/e-resources/LMS: • "JavaScript: The Good Parts" by Douglas Crockford • "You Don't Know JS" by Kyle Simpson • "Learning React" by Alex Banks and Eve Porcello

*Applicable for courses having practical components.

Scheme: 2023-24, Syllabus: 2024-25	
Part A - Introduction	
Subject	BCA
Semester	VI
Name of the Course	Artificial Intelligence
Course Code	B23-CAP-603
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6
Level of the course (As per Annexure-I	300-399
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. learn the basic Artificial Intelligence (AI) concept and its application areas. 2. acquire the knowledge of heuristic search and approaches for knowledge representations. 3. understand the idea of natural language processing and predicate logic 4. gain the knowledge of learning technologies & build expert systems. 5*. Understand the practical aspects of artificial intelligence.

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

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	Introduction to Artificial Intelligence (AI), Importance of AI, AI and its Related Field, AI Techniques, Criteria for success. Problem Space and Search: Problem as a State Space Search, Production System and its Characteristics, Issues in the Design of the Search Problem.	11
II	Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction. Knowledge Representation: Definition and Importance of Knowledge, Knowledge Representation, Various Approaches Used in Knowledge Representation, Issues in Knowledge Representation.	11
III	Using Predicate Logic: Representing Simple Facts in Logic, Representing Instances and is-a Relationship, Computable Function and Predicate, Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Discourse and Pragmatic Processing.	11
IV	Learning: Introduction to Learning, Rote Learning, Learning by Taking Advice, Learning in Problem-Solving, Learning from Example-Induction, Explanation-Based Learning. Expert System: Introduction, Representing Using Domain-Specific Knowledge, Expert System Shells.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Problem Solving and Search Algorithms • Implementing uninformed search algorithms (Breadth-First Search, Depth-First Search) • Implementing informed search algorithms (A*, Greedy Best-First Search) Knowledge Representation and Reasoning • Implementing basic logic representation (Propositional and Predicate Logic) • Building simple inference engines • Developing rule-based systems for decision-making Introduction to Expert Systems • Understanding the components of expert systems • Designing knowledge bases using rule-based systems Expert Systems Applications • Developing expert systems for specific domains (e.g., medical diagnosis, financial advisory) • Case studies of successful expert systems	30
Suggested Evaluation Methods		

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5	**End-Term Examination:** A three-hour exam for both

• Mid-Term Exam: 10
 	
➢ **Practicum**
  • Class Participation: NA
  • Seminar/Demonstration/Viva-voce/Lab records etc.: 10
  • Mid-Term Exam: NA
	theory and practicum.
	End Term Exam Marks: 70(50(T)+20(P))

Part C-Learning Resources

Recommended Books/e-resources/LMS:
- E. Rich and K. Knight, Artificial Intelligence, TMH.
- D.W. Patterson, Introduction to AI and Expert Systems, PHI.
- Nils J Nilsson, Artificial Intelligence -A new Synthesis, Harcourt Asia Ltd.

*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
Semester	VI
Name of the Course	Basics of Data Science using Python
Course Code	B23-CAP-604
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6
Level of the course (As per Annexure-I	300-399
Pre-requisite for the course (if any)	Must have basic knowledge of computer
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the fundamental concepts of data science and the role of Python in data analysis. 2. To learn data cleaning, preparation, and visualization techniques using Python. 3. To apply statistical analysis and predictive modeling using Python. 4. To explore advanced Python libraries and data analysis tools. _____ 5*. to implement the programs based on data science in Python.

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. 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	Introduction to Data Science: Definition, importance, and applications. Overview of Python: Python programming basics, data types, and structures. Introduction to Python Libraries: NumPy, pandas, and matplotlib. Basic Data Manipulation: Reading and writing data files, basic operations with pandas DataFrame.	11
II	Data Import and Export: Handling CSV, Excel, and other file formats. Data Cleaning Techniques: Handling missing values, duplicates, and data inconsistencies. Data Transformation: Data type conversion, normalization, and scaling. Data Visualization: Creating and customizing plots using matplotlib and Seaborn.	11
III	Descriptive Statistics: Calculating mean, median, mode, standard deviation, and variance using pandas. Inferential Statistics: Conducting hypothesis testing, t-tests, and chi-square tests. Regression Analysis: Implementing simple linear regression and multiple regression using scikit-learn. Predictive Modeling: Introduction to basic predictive models such as decision trees and logistic regression.	11
IV	Advanced Python Libraries: Exploring advanced pandas, NumPy, and scikit-learn features. Data Analysis Tools: Time series analysis, clustering, and classification using scikit-learn. What-If Analysis Tools: Sensitivity analysis and scenario analysis using Python.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Introduction to Python for Data Science • Setting up the Python environment (Anaconda, Jupyter Notebook) • Introduction to libraries: NumPy, pandas, Matplotlib, and Seaborn Data Manipulation with pandas • Importing and exporting data • Data cleaning and preprocessing • Data transformation and aggregation Data Visualization • Creating basic plots with Matplotlib • Advanced visualization with Seaborn Exploratory Data Analysis (EDA) • Descriptive statistics and data summarization	30

- Detecting and handling missing values - Identifying patterns and correlations in data Descriptive Statistics - Implementing regression using Sci-kit learn - Implementing predictive modelling and decision tress - Implementing basic statistics and various tests used in statistics - Implementing various data analysis tools	

Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory** - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➢ **Practicum** - 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.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: "Python Data Science Handbook: Essential Tools for Working with Data" by Jake VanderPlas. "Python for Data Analysis: Data Wrangling with pandas, NumPy, and IPython" by Wes McKinney. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron. "Data Science from Scratch: First Principles with Python" by Joel Grus. "Think Stats: Exploratory Data Analysis" by Allen B. Downey.	

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2023-24	
Part A - Introduction	
Subject	COMPUTER SCIENCE
Semester	III
Name of the Course	Mobile App Designing
Course Code	B23-VOC-301
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC
Level of the course (As per Annexure-I	
Pre-requisite for the course (if any)	
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. know the components and structure of mobile application development frameworks for Android based mobiles; 2. design and implement the user interfaces of mobile applications. 3. understand the concept of Intents 4. implement fragments in Android application; 5. _____ 5*. understand the designing of a mobile application.

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	Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Mobile devices Profiles. Basics of Android, Importance and scope, Android Versions, Features of Android, Android Architecture, Android Stack, Android Applications Structure, Android Emulator, Android SDK, Overview of Android Studio, Android and File Structure, Android Virtual Device Manager, DDMS, LogCat.	10
II	Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts – Linear, Relative, Grid and Table Layouts. User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, List View, Spinner View.	10
III	Event Handling – Handling clicks or changes of various UI components. Intents and Broadcasts: Intent – Using intents to launch Activities, explicitly starting new Activity, Implicit Intents Services- Callbacks and Override in application, Application Signing, API keys for Google Maps, Publishing application to the Android Market.	10
IV	Fragments – Creating fragments, Lifecycle of fragments, Fragment states, adding fragments to Activity, adding, removing and replacing fragments with fragment transactions; Introduction to SQLite database	10
V*	Practical List: 1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the emulator. Also display "Hello World" in the middle of the screen in the Android Phone. 2. Create an application with three buttons (increment, decrement and reset) and a textView aligned vertically. On clicking, increment/decrement button, the value of the textview should increment/decrement by 1while selecting reset button, the value of textview should become zero. 3. Create an application with login module. (Check username and password). 4. Create an application to display various activity life cycle methods. 5. Create an application using explicit Intents. 6. Create an application using implicit Intents. 7. Create an application to display various fragment life cycle	25

	methods.	
	8. Create an application with 2 fragments, one to set the background and other to set the fore-color of the text.	

Suggested Evaluation Methods

Internal Assessment:
➢ **Theory**
  • Class Participation: 5
  • Seminar/presentation/assignment/quiz/class test etc.: 5
  • Mid-Term Exam: 10
 	
➢ **Practicum**
  • Class Participation: 5
  • Seminar/Demonstration/Viva-voce/Lab records etc.: 5
  • Mid-Term Exam: NA
	End Term Examination: A three hour exam for both theory and practicum.

Part C-Learning Resources

Recommended Books/e-resources/LMS:
- Zigurd Mednieks, Laird Dornin, G,BlakeMeike and Masumi Nakamura, Programming Android, O'Reilly Publications.
- Wei-Meng Lee, Beginning Android Application Development, Wiley India Ltd.
- James C.S., Android Application development for Java Programmer, CENGAGE Learning.
- Pradeep Kothari, Android Application Development: Black Book, Wiley India Ltd.
- Gargenta M., Nakamura M., Learning Android, O'Reilly Publications.