

Semester V

Part A-Introduction			
Name of Programme	BCA		
Semester	V		
Nature of Course/Course Composition	Theory		
Name of the Course	Software Engineering		
Course Code	24 L5.5-BCA-501		
Course Type	CC-A5		
Course Level	300-399		
Pre-requisite for the course (if any)	Knowledge of any Programming language		
Course Learning Outcomes (CLOs ₁) After completing this course, the learner will be able to:	CLO ₁ -Learn the various models for software development. understand how to analyze software. CLO ₂ -Plan a software design and the risks associated with software. CLO ₃ -test and validate software CLO ₄ -Implement the various tools and techniques used in software engineering.		
	Theory	Practical	Total
Credits	4	0	4
Teaching hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Duration (in Hours)	03		
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no. 1 and 1 question from the each of the four units.			
Unit	Topics		Contact Hours/ CLOs
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.		15/CLO ₁
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		15/CLO ₂
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.		15/CLO ₃

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.	15/CLO4
	Total Contact Hours	60
Evaluation Methods		
Internal Assessment:30 Marks		End Term Examination:70 Marks
● Class Participation:	5	Written Examination:70
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
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.		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	2	3	1	3	3	3	3	2	3	3
CLO ₃	1	3	3	3	3	2	3	3	3	1	3
CLO ₄	3	3	3	3	2	2	2	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	BCA		
Semester	V		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Front-end and Back-end Development		
Course Code	24 L5.5-BCA-502		
Course Type	CC-B5		
Course Level	300-399		
Pre-requisite for the course(if any)	Knowledge of any Programming language		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Understand the principles of back-end development. CLO ₂ - Gain proficiency in back-end programming languages and frameworks. CLO ₃ - Learn to design and manage databases. CLO ₄ - Develop skills to create and use back-end applications.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
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		15/CLO ₁

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 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	15/CLO ₂
III	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)	15/CLO ₃
Practical	Programming Lab: • Introduction to Backend Technologies: Objective: Familiarize students with backend technologies and tools. • Setup development environment (e.g., IDE, Git). • Create a simple “Hello World” backend application in Node.js. • Working with Databases (SQL): Objective: Learn basic SQL operations and database interactions. • Set up MySQL/PostgreSQL database. • Perform CRUD operations using SQL queries (Create, Read, Update, Delete). • Working with NoSQL Databases: Objective: Introduce students to NoSQL databases. • Set up MongoDB database. • Implement CRUD operations using NoSQL commands. • Building RESTful APIs: Objective: Develop skills in designing and implementing RESTful APIs. • Create endpoints for CRUD operations. • Implement basic authentication and authorization. • Web Frameworks (Choose one: Node.js or Express.js): Objective: Gain practical experience with backend frameworks. • Setup Node.js/Express.js project. • Implement a simple web application (Express.js or Node.js). • Integrating Frontend and Backend: Objective: Understand frontend-backend interaction. • Create API endpoints to serve JSON data. • 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. • Implement input validation using middleware (Express.js) or Node.js forms. • Handle errors and exceptions gracefully. • Security Best Practices: Objective: Implement security measures in backend applications. • Implement HTTPS/SSL configuration. • Prevent common security vulnerabilities (e.g., SQL injection, XSS).	30/CLO ₄
Contact Hours		75
Evaluation Methods		
Internal Assessment	TH-25	PR-5
End Term Examination:70		TH-50 PR-20

• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
• Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
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					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	2	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	2	3	3	1	2	3	3
CLO ₃	1	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	3	2	3	2	1	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A–Introduction			
Name of the Programme	BCA		
Semester	V		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Linux and Shell Programming		
Course Code	24 L5.5-BCA-503		
Course Type	CC-C5		
Course Level	300-399		
Pre-requisite for the course(if any)	Must have basic knowledge of computer		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - understand Linux architecture. CLO ₂ - use various Linux commands that are used to manipulate system operations. CLO ₃ - acquire knowledge of Linux File System. CLO ₄ - understand and make effective use of I/O and shell scripting language to solve problems.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
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.		15/CLO ₁
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.		15/CLO ₂

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. Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux.	15/CLO ₃			
Practical	Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • 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 declare the result. • Write a shell script program to find area of a square, rectangle, circle and triangle.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
• Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS:					
• 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.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

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Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Semester VI

Part A–Introduction			
Name of the Programme	BCA		
Semester	VI		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Programming using Python		
Course Code	24 L5.5-BCA-601		
Course Type	CC-A6		
Course Level	300-399		
Pre-requisite for the course(if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - understand the basic concepts of Python programming CLO ₂ - learn various data structures used in Python programming. CLO ₃ - develop the simple programs of Python using arrays and functions. CLO ₄ - illustrate the process of data file manipulations using python* develop the programs using Python.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs

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	15/CLO ₁
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.	15/CLO ₂
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. 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.	15/CLO ₃
Practical	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 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.	30/CLO ₄

Contact Hours					75
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration /Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
• Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
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). • Gutttag 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.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	2	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	3	2	3	3
CLO ₃	1	3	3	3	3	3	3	2	3	3	3
CLO ₄	3	3	3	3	2	2	2	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A – Introduction			
Name of the Programme	BCA		
Semester	VI		
Nature of Course/Course Composition	Theory		
Name of the Course	Advanced Web Development		
Course Code	24 L5.5-BCA-602		
Course Type	CC-B6		
Course Level	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - gain proficiency in advanced web development frameworks and tools. CLO ₂ - understand the principles of responsive design and progressive web apps. CLO ₃ - learn best practices for database management and full-stack development. CLO ₄ - know about optimization and develops.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B- Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs

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) 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)	15/CLO ₁			
II	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	15/CLO ₂			
III	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)	15/CLO ₃			
Practical	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/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination: 70	TH-50	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/ assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/V iva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
• Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
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

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	3	3	3	3	3	2	3	2
CLO ₂	3	3	3	3	3	3	3	2	2	3	3
CLO ₃	1	3	3	2	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A - Introduction			
Name of Programme	BCA		
Semester	VI		
Nature of Course/Course Composition	Theory		
Name of the Course	Artificial Intelligence		
Course Code	24 L5.5-BCA-603		
Course Type	CC-C6		
Course Level	300-399		
Pre-requisite for the course (if any)	Basic understanding of computer systems and programming.		
Course Learning Outcomes (CLOs.) After completing this course, the learner will be able to:	After completing this course, the learner will be able to: CLO ₁ - learn the basic Artificial Intelligence (AI) concept and its application areas. CLO ₂ - acquire the knowledge of heuristic search and approaches for knowledge representations. CLO ₃ - understand the idea of natural language processing and predicate logic CLO ₄ - gain the knowledge of learning technologies & build expert systems Understand the practical aspects of artificial intelligence.		
	Theory	Practical	Total
Credits	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Duration (in Hours)	03		
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u>			
The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no. 1 and 1 question from the each of the four units.			
Unit	Topics	Contact Hours/ CLOs	
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.	15/CLO ₁	
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.	15/CLO ₂	

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.	15/CLO ₃
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.	15/CLO ₄
	Total Contact hours	60
Evaluation Methods		
Internal Assessment: 30 Marks		End Term Examination: 70 Marks
• Class Participation:	5	Written Examination: 70
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
• E. Rich and K. Knight, “Artificial Intelligence”, TMH, 2nd Ed.,1992.		
• N. J. Nilsson, “Principles of AI”,Narosa Publ. House,1990.		
• M. N. Hoda, “Foundation Course in Artificial Intelligence”, Vikas Pub.,2004.		
• Artificial Intelligence” RBMishra,PHI		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	2	3	3	1	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	1	3	3	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60