



Date :- 25/04/2025

NOTIFICATION

Sub :- CBCS Syllabi of BCA (Sem. V & VI)

Ref. :- Decision of the Academic Council at its meeting held on 22/04/2025.

The Syllabi of BCA (Fifth and Sixth Semesters) as per **NATIONAL EDUCATION POLICY - 2020 (2023 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2025-26.

Copy of the Syllabi Shall be downloaded from the College Website
(www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

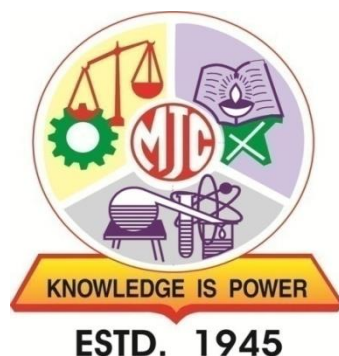
Khandesh College Education Society's
Moolji Jaitha College, Jalgaon

An "Autonomous College"

Affiliated to

Kavayitri Bahinabai Chaudhari

North Maharashtra University, Jalgaon-425001



STRUCTURE AND SYLLABUS
BCA Honours / Honours with Research
(T.Y.B.C.A)

as per NEP-2020 Guidelines

[w.e.f. Academic Year: 2025-26]

Preface

There are various innovative technologies that have come up in the IT world which are transforming the business landscape at a rapid pace. The challenges of the IT sector today are a lot different from those that existed a few years ago. The changing technological environment has made it necessary for students who aspire to a career in IT to be well aware of the latest innovations. The BCA program is specially designed to cater to the present industry skills and knowledge needs. It comprises of theoretical and practical training sessions that can prepare students for the well-rewarding jobs of the future.

Programme Outcomes (PO) for B.C.A. honours/ Honours with Research :

Upon successful completion of this Programme, student will be able to:

PO No.	PO
1	Discipline knowledge: Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
2	Problem Solving: Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3	Design and Development of Solutions: Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
4	Programming a computer: Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
5	Application Systems Knowledge: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
6	Motivation to take up Higher Studies: Inspiration to continue educations towards advanced studies on Computer Science.

Programme Specific Outcome (PSO) for B.C.A. Honours/Honours with Research:

After completion of this course, students are expected to:

PSO No.	PSO
1	Apply standard Software Engineering practices and strategies in real -time software project development
2	Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing and data analytics.
3	The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.
4	The ability to apply the knowledge and understanding noted above to the analysis of a given

	information handling problem.
5	Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems
6	Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours Or Bachelor's Degree- Honours with Research	160	176	8	4

T. Y. B.C.A Structure and Syllabus (2025-26)

Semester	Course	Credit	Hours/	TH/	Code	Title
	Module		week	PR		
V	DSC	2	2	TH	BCA-DSC-351	Cyber Security
	DSC	2	2	TH	BCA-DSC-352	ASP.NET
	DSC	2	4	TH	BCA-DSC-353	Python Programming -I
	DSC	2	4	PR	BCA-DSC-354	Practical on ASP.NET
	DSC	2	2	PR	BCA-DSC-355	Practical on Python Programming -I
	DSE	2	2	TH	BCA- DSE- 351A	Artificial Intelligence
	DSE	2	2	TH	BCA- DSE -351B	Digital Image Processing-I
	DSE	2	4	PR	BCA- DSE 352A	Practical on AI using Python
	DSE	2	4	PR	BCA- DSE 352B	Practical on Digital Image Processing-I
	VSC	2	2	TH	BCA- VSC 351	Data Analytics
	VSC	2	4	PR	BCA- VSC 352	Practical on Data Analytics
	DSC	4	6	PR	BCA – DSC-351	OJT
Semester	Course	Credit	Hours/	TH/	Code	Title
	Module		week	PR		
VI	DSC	2	2	TH	BCA-DSC 361	Cloud Computing
	DSC	2	2	TH	BCA-DSC 362	Server Side Scripting using PHP
	DSC	2	2	TH	BCA-DSC 363	Python Programming -II
	DSC	2	2	TH	BCA-DSC 364	Computer Network
	DSC	2	2	TH	BCA-DSC 365	Evolution of Computing in India
	DSC	2	4	PR	BCA-DSC 366	Practical on Server Side Scripting using PHP
	DSC	2	4	PR	BCA-DSC 367	Practical on Python Programming -II
	DSE	2	2	TH	BCA-DSE 361A	Machine Learning
	DSE	2	2	TH	BCA-DSE 361B	Digital Image Processing-II
	DSE	2	4	PR	BCA-DSE 362A	Practical on Machine Learning using Python
	DSE	2	4	PR	BCA-DSE 362B	Practical on Digital Image Processing-II
	VSC	2	2	TH	BCA-VSC 361	R Programming
	VSC	3	4	PR	BCA-VSC 362	Practical on R Programming

SEMESTER-V

T.Y.BCA**SEMESTER-V****BCA-DSC-351: Cyber Security****Total Hours: 30****Credits: 2**

Course objectives	- Analyse and resolve security issues in networks and computer systems to secure an IT infrastructure. - To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets. - To develop graduates that can identify, analyse, and remediate computer security breaches. - Identify the key cyber security vendors in the marketplace	
Course outcomes	After successful completion of this course, students are expected to: - By the end of the course students will be able to - Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training - Obtain basic knowledge of Ethical Hacking and its Benefits	
Unit	Content	Hours
Unit I	UNIT-I – Overview of Cyber Security & Networking Concepts - Introduction to Cyber Security , - Knowing some cyber security basics and putting them in practice for Business Protection, - Basics of Communication Systems, - Transmission Media, Topology and Types of Networks, OSI Layers, TCP/IP Protocol Stacks, Wireless Networks, - Overview of Identification and Authorization, - Overview of IDS , Intrusion Detection Systems and Intrusion Prevention Systems, - Virtual Private Networks - Need, Use of Tunnelling with VPN, , Types of VPNs and their Usage, Authentication Mechanisms	7
Unit II	UNIT-II- Cryptography / Encryption & Online Communication - Introduction to Cryptography / Encryption, - Model of Cryptographic Systems, - Issues in Documents Security , - Requirements for Digital Signatures, - Applications of Cryptography , - Tools and techniques of Cryptography, - Online Communication- Introduction, Working Undercover, - Website Evidence, Background Searches on a Suspect, - Online Crime, Capturing Online Communications	8
Unit III	UNIT-III – Security and Cyber Forensics - Introduction to Cyber Crime and Cyber Forensics, - Basic Forensic Principles, - Network Forensics, Mobile Device Forensics, - Memory Forensics,	7

	• General Computing Principles, Search and Seizure of Computers, Forensic Imaging & Verification, • Data Recovery and Analysis, Investigative Techniques, • DNS & DNS Servers, The principles of digital evidence	
Unit IV	UNIT-IV- Introduction to Mobile Forensics • Mobile Phone Basics, Types of memory on mobile phones , • Cell Phone Crime , • The Cellular Network, SIM Security , • Mobile forensic & its challenges , • Mobile phone evidence extraction process , • Evidence in Mobile Devices	8
Study Resources	• Practical Cyber Forensics , Niranjan Reddy • Merkov, Breithaupt,“ Information Security”, Pearson Education • Yadav, “Foundations of Information Technology”, New Age, Delhi • Penetration Testing: A Hands-on Introduction to Hacking - Georgia Weidman • Handbook of Digital Forensics and Investigation, Edited by Eoghan Casay, Elsevier Academic Press, ISBN 13 : 978-0-12-374267-4	

T.Y.BCA

SEMESTER-V

BCA-DSC-352: ASP.NET

Total Hours: 30

Credits: 2

Course Objectives	• To describe the .Net Framework, its components and features. · • To introduce the ASP.NET. • To demonstrate the use of various controls to design a web application. · • To demonstrate the use of ADO.NET	
Course Outcomes	After successful completion of this course, students are expected to: • Upon completion of this course the students should be able to understand the .NET framework · • Develop a proficiency in the ASP.NET · • Develop ASP.NET web applications on any given scenario.	
Unit	Contents	Hours
Unit I	Introduction • Introduction to Asp.Net • Structure of Asp.NetPage • ASP.Net CompilationModel • Code BehindModel • Execution Stages and Event Model for the PageClass	08
Unit II	ASP.NETControls • Introducing WebForms • HTMLControls • WebControls • BasicControls • UserControls • ASP.Net RichControls • Validation Controls • ASP.Net Page Directives	08
Unit III	ASP.Net Intrinsic Objects • HTTP RequestObject, HTTP ResponseObject • HTTP Server UtilityObject • HTTP Application StateObject • HTTP Session stateObject • Object Contextobject	07
Unit IV	Data AccesswithADO.Net • ASP.Net Data ListControls • Working With ADO.Net • Using BasicSQL • Working With ASP.NetObject • Data ReaderObject • Data TableObject • Data RowObject • Data Column Object	07

	• Data RelationObject	
Study Resources	• Kogent Learning Solutions, “.NET 4.0 Programming 6 in 1 Black Book”, ISBN: 9789350045107, by DreamtechPress,2013. • Crouch, Matt J, “Asp.Net and Vb.Net Web Programming ”ISBN: 9780201734409, Addison-Wesley,2002. • J.Liberty,D.Hurwitz , Programming ASP.Net, ISBN: 978-0596529567, O&#39;Reilly Media ,4THEdition • WEB References:-1. http://www.tutorialspoint.com	

T.Y.BCA
SEMESTER-V
BCA-DSC-353: Python Programming–I

Total Hours: 30

Credits: 2

Course objectives	- The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language. To learn how to design and program Python applications. - To develop problem solving skills and their implementation through Python. - Master the fundamentals of writing Python scripts	
Course outcomes	After successful completion of this course, students are expected to: - Explain basic principles of Python programming language - Construct and apply various filters for a specific task. - Apply the best features of mathematics, engineering and natural sciences to program real life problems.	
Unit	Content	Hours
Unit I	Introduction to Python Programming - Introduction to Python - History of Python - Version of Python - Need, Features of Python - Applications of Python - Installing Python on Linux and Windows - Installing Python IDE	7
Unit II	Basics of Python Programming - Python Identifiers, Variables and Keywords - Putting Comments - Expressions and Statements - Standard Data Types – Basic, None, Boolean, Numbers. - Type Conversion Function - Operators in Python - Operator Precedence - Accepting Input and Displaying Output - Flow Control Statements: Conditional Statements - Looping Statements, break, continue, pass Statements	8
Unit III	Python Strings - Introduction to String - String Literals - Assign String to a Variable - Multiline Strings Operations on Strings, Index Operator: Working with the Characters of a String, String - Methods, Length, The Slice Operator, String Comparison, Concepts of Python Lists: Creating, Initializing and Accessing elements in lists, - Traversing, Updating and deleting elements from Lists. - List Operations: Concatenation, List Indexing, Slices	7

	• Built- in List functions and methods • Aliasing, Cloning Lists	
Unit IV	Python Tuples and Dictionary • Introduction to Tuples Creating Tuples. • Deleting Tuples. • Accessing elements in a Tuple. • Tuples Operations: Concatenation, Repetition, Membership, Iteration. • Built- in Tuples functions and methods Python Functions • Introduction to Functions Defining a Function (def) • Calling a Function • Function Arguments - Required arguments, Keyword arguments, • Default arguments, Variable-length arguments Scope of Variables • Void functions and function returning values • Recursion • Advance Function Topics: Anonymous Function Lambda, Mapping Functions	8
Study Resources	• John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hall of India, 2013, ISBN: 9780262525008 • Peter C. Norton, Alex Samuel and others, —Beginning Python, Wrox Publication, 2005 ISBN 10: 0764596543 ISBN 13: 9780764596544 • R. NageswaraRao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427 • Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN13: 978-0132269933, ISBN-10: 0132269937 • Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Python”, Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118- 29027-9(HardCover) • Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705 • Luke Sneeringer(2015), Professional Python, Wiley Inc., 2015, ISBN: 1119070856	

T.Y.BCA

SEMESTER-V

BCA-DSC-354 : Practical on ASP.NET

Total Hours: 30

Credits: 2

Batch Size:12

Course Objectives	• To describe the .Net Framework, its components and features. · • To introduce the ASP.NET. · • To demonstrate the use of various controls to design a web application. · • To demonstrate the use of ADO.NET	
Course Outcomes	After successful completion of this course, students are expected to: • Upon completion of this course the students should be able to understand the .NET framework · • Develop a proficiency in the ASP.NET · • Develop ASP.NET web applications on any given scenario.	
Sr. No.	Contents	Hours
1	Write HTML Program to create Admission form.	4
2	Introduction to the environment of ASP.NET IDE.	4
3	Write an ASP .net program that demonstrate use of HTMLControls	4
4	Write an ASP .net program that demonstrate use of webcontrols.	4
5	Demonstrate the Page Life Cycle.	4
6	Write an ASP .net program that return the windows name of your computer and URL of the page that you are visiting.	4
7	Write an ASP .net program that demonstrate use of Validation Controls.	4
8	Write an ASP .net program that demonstrate use of Custom Validation Control.	4
9	Write an ASP .net program that demonstrate use of IntrinsicObjects.	4
10	Write an ASP .net program that demonstrate Application and Session Scope Variables using Global. Ajax.	4
11	Write an ASP .net program that demonstrate Page directives.	4
12	Write an ASP .net page that used the connection object to connect the database and display information using data gridControls.	4
13	Demonstrate the use of Calender Control	4
14	Demonstrate the use of Adrotator Control	4
15	Demonstrate the use of ASP.Net Data ListControls	4
Study Resources	• Kogent Learning Solutions, “.NET 4.0 Programming 6 in 1 Black Book”, ISBN: 9789350045107, by Dreamtech Press, 2013. • Crouch, Matt J, “Asp.Net and Vb.Net Web Programming” ISBN: 9780201734409, Addison-Wesley,2002. • J. Liberty, D. Hurwitz, Programming ASP.Net, ISBN: 978-0596529567, O&#39;Reilly Media ,4THEdition • WEB References:-1. http://www.tutorialspoint.com	

T.Y.BCA

SEMESTER-V

BCA-DSC-355 : Practical on Python Programming-I

Total Hours: 30

Credits: 2

Batch Size:12

Course objectives	- To provide insight into .NET technologies for web programming and enable them design and develop interactive and responsive web applications. - To explain learners the insights into the efficient usage of .NET technologies their facilities with database - To acquire knowledge of web development GUI	
Course outcomes	After successful completion of this course, students are expected to: - By the end of the course students will be able to - Acquire knowledge of .NET technologies framework - Implement various controls for creating a web Application - Develop Website in .NET Technology - Understand the security aspects of web Application. Instruction: At the time of Practical you can used any Python IDEs and Code Editors• (PyCharm, Spyder, Thonny, etc.).	
No.	Content	Hours
1	Installing python and setting up environment.	4
2	Demonstrate the use of simple statements like printing the names (“Hello World”), numbers, mathematical calculations, etc.	4
3	Write a program to find out the roots of the quadratic equations.	4
4	Write a program to find all prime numbers within a given range.	4
5	Write a program to check the given number is palindrome or not.	4
6	Write a program using for and while loops, including the break and continue statements.	4
7	Write a program to print "n" terms of Fibonacci Series using Iteration	4
8	Write a recursive function to calculate the factorial of a number.	4
9	Write a program demonstrating built-in string methods like .upper(), .lower(), .replace(), find().	4
10	Write a Python function to reverse the given string.	4
11	Write a Programs related to functions & modules	4
12	Demonstrate implementation of the Anonymous Function Lambda.	4
13	Write a program that demonstrate concept of functional programming.	4
14	Write a program to demonstrate the use of list & related functions	4
15	Write a program to demonstrate the use of Dictionary& related functions Write a program to demonstrate the use of tuple.	4
Study Resources	- John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hall of India, 2013, ISBN: 9780262525008 - Peter C. Norton, Alex Samuel and others, —Beginning Python, Wrox Publication,2005 ISBN 10: 0764596543 ISBN 13: 9780764596544 R. NageswaraRao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427	

	• Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN13: 978-0132269933, ISBN-10: 0132269937 • Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Python”, Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118- 29027-9(HardCover) • Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705 • Luke Sneeringer(2015), Professional Python, Wiley Inc.,2015, ISBN: 1119070856	
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T.Y.BCA

SEMESTER-V

BCA-DSE-351 (A): Artificial Intelligence

Total Hours: 30

Credits: 2

Course objectives	• Understand neural network concepts, architectures, and types. • Explore learning methods and training techniques in ANNs. • Study key models like perceptrons and back propagation. • Learn neural network applications in speech, recognition, and fuzzy systems.	
Course outcomes	After successful completion of this course, students are expected to: • Understand the characteristics of rational agents, and the environment in which they operate, and gain insights about problem-solving agents. • Train neural networks using various learning algorithms. • Implement and analyze models like perceptrons and neural fuzzy systems. • Apply neural networks to real-world problems, including speech and character recognition.	
Unit	Content	Hours
Unit I	Introduction to AI • What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of Agents. • Knowledge Based Agents: Introduction to Knowledge-Based Agents, The Wumpus World as an Example World. • Problem-solving: Problem-solving agents.	7
Unit II	Advanced Search Techniques • Uninformed Search: DFS, BFS, Iterative Deepening Search. • Informed Search: Best First Search, A* search, AO* search. • Adversarial Search & Games: Two player zero-sum games, Minimax Search, Alpha-Beta pruning. • Constraints and Constraint Satisfaction Problems (CSPs), Backtracking search for CSP	8
Unit III	Logical Reasoning and Uncertainty • Logic: Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting. • Inference: Forward chaining, Backward chaining, Resolution, Truth maintenance systems. • Introduction to Planning: Blocks World problem, Strips. • Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, Introduction to Fuzzy logic	7
Unit IV	Domains and Applications of AI • Domains in AI: Introduction to Machine Learning, Computer Vision, Robotics, Natural Language Processing, Deep Neural Networks and their Applications. • Expert Systems: The architecture and role of expert systems.	8

Study Resources	• M.C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company, 2024 (AICTE Recommended Textbook). • Nilsson Nils J, Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4. • Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI Learning 2010. • Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company, 2024. • M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024. • Russell, S. and Norvig, P., “Artificial Intelligence - A Modern Approach”, 3rd 101CC207/ 102CC207 Artificial Intelligence 3L:0T:0P 3 Credits edition, Prentice Hall • Van Hirtum, A. & Kolski, C. (2020). Constraint Satisfaction Problems: Algorithms and Applications. Springer • Rajiv Chopra, Machine Learning and Machine Intelligence, Khanna Book Publishing Company, 2024.	
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T.Y.BCA

SEMESTER-V

BCA- DSE -351 (B) : Digital Image Processing-I

Total Hours: 30

Credits: 2

Course objectives	• To equip students with the fundamental knowledge and basic technical competence in the field of Computer Graphics and Digital Image Processing. • To provide an understanding of how to scan convert the basic geometrical primitives, basic principles of 2 and 3- dimensional computer graphics. • To be able to discuss the application of computer graphics concepts in the development of information visualization, and business applications • Give an in-depth knowledge about the basic theory and algorithms related to Digital Image Processing	
Course outcomes	After successful completion of this course, students are expected to: • Develop scientific and strategic approach to solve complex problems Computer in the domain of Computer Graphics and Digital Image Processing. • Demonstrate various algorithms for scan conversion and filling of basic primitives objects and their comparative analysis and applied 2-D and 3-D geometric transformations, viewing and clipping on graphical objects. • Built the mathematical foundations for digital image representation, image acquisition, image transformation, image enhancement and restoration. • Develop a theoretical foundation of fundamental concepts of digital image processing.	
Unit	Content	Hours
Unit I	Introduction to Digital Image Processing & Applications: • Digital Image Processing. Applications of Digital Image Processing, • Fundamental Steps in Digital Image Processing, • Components of an Image Processing System, Image Sensing and Acquisition. • Image Sampling and Quantization. • Some Basic Relationships between Pixels.	7
Unit II	Image Processing Fundamental • Elements of Visual Perception, • Image Sensing and Acquisition, • Image Sampling and Quantization, • Some Basic Relationships between Pixel, • Array versus Matrix operation, • Linear versus Nonlinear Operations.	8
Unit III	Image Enhancement: • Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, • Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods,	7

	• Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.	
Unit IV	Image Restoration and Color Image Processing: • A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only- Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant egradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Color Fundamentals, Color Models, Pseudocolor Image Processing, • Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.	8
Study Resources	• R.C.Gonzalez & R.E.Woods, Digital Image Processing, Pearson Education, 3rd edition, ISBN. 13:978-0131687288 • S. Jayaraman Digital Image Processing TMH (McGraw Hill) publication, ISBN-13:978-0-07-0144798 • Gonzalez R., Woods R., (2002).“Digital Image Processing”, 2nd Ed., Prentice Hall. • Sridhar S., (2011).“Digital Image Processing”, 1st Ed, Oxford University Press. • Jain A.,(1995).“Fundamentals of Image processing”, 1st Ed., , Prentice Hall of India Publication.	

T.Y.BCA

SEMESTER-V

BCA- DSE-352 (A) : Practical on AI using Python

Total Hours: 60

Credits:02

Batch Size:12

Course Objectives	To understand and learn: • To explore most common artificial intelligence (AI) use cases. • To implement various new artificial intelligence techniques. • To create real-world AI application/s using above AI techniques.	
Course Outcomes	After successful completion of this course, students are expected to: • Use most common artificial intelligence (AI) use cases in developing AI applications. • Apply various new artificial intelligence techniques in developing AI applications. • Create real-world AI application/s using above AI techniques.	
Sr. No.	Content	Hours
1	Identifying Agents and Environments – List five real-world AI agents with their environment, sensors, actuators, and goals.	4
2	Simple Knowledge-Based Agent – Write basic IF-THEN rules for an AI system like a smart thermostat.	4
3	Demonstrate basic problem-solving using Breadth-First Search on a simple grid.	4
4	Implement Depth-First Search (DFS) on a small graph.	4
5	Solve the Water Jug Problem using Breadth First Search (BFS).	4
6	Implement a Hill Climbing search to find the peak in a numeric dataset.	4
7	Apply the A* Search algorithm to find the shortest path in a 4x4 grid.	4
8	Implement the Minimax search algorithm for 2-player games. You may use a game tree with 3 plies.	4
9	Solve the 4 – Queens Problem as a CSP backtracking problem	4
10	Use constraint propagation to solve a Magic Square puzzle.	4
11	Apply optimization techniques to find the maximum value in a list.	4
12	Represent and evaluate propositional logic expressions.	4
13	Implement a basic rule-based expert system for weather classification.	4
14	Implement a basic AI agent with simple decision-making rules.	4
15	Implement a basic Rule-Based Chatbot	4
Note: The lab experiments may be implemented in Python. Libraries like NLTK, Tensorflow and Keras may be used for Machine learning experiments.		

Study Resources	• Maheshwari, A. (2017). Data analytics. McGraw-Hill Education. • Rajasekaran, S., & Pai, G. A. V. (2017). Neural networks, fuzzy systems, and evolutionary algorithms: Synthesis and applications (2nd ed.). PHI Learning. • Aggarwal, C. C. (2016). Recommender systems: The textbook. Springer. • Jain, V. K. (2015). Big data and Hadoop. Khanna Book Publishing. • Yegnanarayana, B. (1999). Artificial neural networks. Prentice-Hall of India	
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T.Y.BCA

SEMESTER-V

BCA- DSE -352 (B) : Practical on Digital Image Processing-I

Total Hours: 60

Credits: 2

Batch Size:12

Course Objectives	To understand and learn: • To acquire basic knowledge of Digital image processing • To introduce MATLAB to implement the complex algorithms of Digital Image Processing. • Provide hands-on experience to process digital images and expose students to MATLAB Image Processing Toolbox for Digital Image Enhancement, • Provide filtering, noise removal in image	
Course Outcomes	After successful completion of this course, students are expected to: • Expose students to MATLAB and Image Processing Toolbox. • Use various tools in MATLAB to implemented image transformation, image enhancement in spatial and frequency domain. • Develop the programs on various digital image processing techniques. • Develop program for image filtering and noise removal	
Sr. No.	Content	Hours
1	Introduction to Image Processing Toolbox	4
2	Write a program to read an 8 bit image and then apply image enhancement techniques: Brightness improvement	4
3	Write a program to read an 8 bit image and then apply image enhancement techniques: Brightness reduction	4
4	Write a program to apply image enhancement techniques: Thresholding	4
5	Write a program to apply image enhancement techniques: Negative of an image and Log transformation	4
6	Write a program to apply image enhancement techniques: Power Law transformation.	4
7	Write a program to Plot image histogram then do histogram equalization.	4
8	Write a program to Read an image and apply Gray level slicing	4
9	Write a program to Read an image and apply adaptive threshold image.	4
10	Write a program to Read an image and apply denoised image	4
11	Write a program to Read an image and apply binary level image.	4
12	Write a program to Read an 8 bit image and to see the effect of each bit on the image.	4
13	Write a program to Read an image and to extract 8 different planes.	4
14	Write a program to Implement various Smoothing spatial filters.	4
15	Write a program to Read an 8 bit image and to see the effect of Position.	4

Study Resources	• Gonzalez R., Woods R., (2002).“Digital Image Processing”, 2nd Ed., Prentice Hall. • Jayaraman S , (2009).”Digital Image Processing”, 1st Ed., TMH(McGraw Hill Education) publication. • Jain A.,(1995).“Fundamentals of Image processing”, 1st Ed., , Prentice Hall of India Publication. • Sridhar S., (2011).“Digital Image Processing”, 1st Ed, Oxford University Press.	

T.Y.BCA**SEMESTER-V****BCA- VSC-351: Data Analytics****Total Hours: 30****Credits: 2**

Course objectives	• To study the fundamental data analysis • Learn to build and maintain reliable, scalable, distributed systems • To describe Data Visualization	
Course outcomes	After successful completion of this course, students are expected to: • By the end of the course students will be able to • Students will learn injecting data • Data processing and data quality • They will able to learn distributed systems	
Unit	Content	Hours
Unit I	Introduction to big data • Introduction, distributed file system, • Big Data and its importance, Drivers • Big data analytics, • Big data applications. Introduction to Data Warehouse • Data Warehouse and DBMS Architecture of Data Warehouse • Applications of Data Warehouse	7
Unit II	Introduction to Data Mining • Basic concepts of data mining • Applications of Data Mining • Differences between Data Mining and Data Warehousing • Data Mining Issues • Types of Data to be mined • Stages of the Data Mining Process • Data Mining Techniques.	8
Unit III	Introduction SAS • Features, Advantage & Disadvantage • Architecture • Applications. Data Set Operations • PROC sorting SAS • Multiple variable sorting • Merge Data sets • Concatenate Multiple data set • Format data set.	7
Unit IV	SAS Program Structure • Variables • String • Array • SAS Function	8

	• Loops • Decision Making.	
Study Resources	• Chris Eaton, Dirk deroos et al. “Understanding Big data ”, McGraw Hill, 2012 • Data Mining: Concepts and Techniques, Han, Elsevier ISBN:9789380931913 / 9788131205358 • Data warehousing: fundamentals fot IT professionals 3rd edition , Kimball, Wiley Publication • Introduction to Data Mining (2005) By Pang-Ning Tan, Michael Steinbach, Vipin Kumar Addison Wesley ISBN: 0-321-32136-7 • “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data” by EMC Education Services	

T.Y.BCA

SEMESTER-V

BCA- VSC-352: Practical on Data Analytics

Total Hours: 60

Credits: 2

Batch Size:12

Course objectives	• To study the fundamental data analysis • Learn to build and maintain reliable, scalable, distributed systems • To describe Data Visualization	
Course outcomes	After successful completion of this course, students are expected to: • By the end of the course students will be able to • Students will learn injecting data • Data processing and data quality • They will able to learn distributed systems	
Sr. No.	Content	Hours
1	Write a program for sort.	4
2	Write a program for variable.	4
3	Write a program for merge.	4
4	Write a program for Concatenate.	4
5	Write a program for format data.	4
6	Write a program for String.	4
7	Write a program for array.	4
8	Write a program demonstrates the use of basic arithmetic operators in SAS.	4
9	Write a program demonstrates how to use relational operators (comparison operators) in SAS.	4
10	Write a program demonstrates how to use logical operators in SAS.	4
11	Write a program to checks if two numbers are both within a certain range using logical operators.	4
12	Write a program assigns a grade based on the score using relational operators.	4
13	Write a program for functions.	4
14	Write a program for loops	4
15	Write a program for decision making statement	4
Study Resources	• “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data” by EMC Education Services • “Big Data: Does Size Matter?” by Timandra Harkness • “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Businesses” by Michael Minelli • Exploring Modern Regression Methods Using SAS®: Special Collection Foreword by Phil Gibbs • Data Management with SAS®: Special Collection Foreword by Ron Agresta • Visualizing Data with SAS® : Selected Topics Foreword by Robert Allison	

T.Y.BCA

SEMESTER-V

BCA -OJT-351: On Job Training/Internship

Total Hours: 120

Credits:4

Course objectives	• To provide the students with actual work experience • To make aware prescribe standards and guidelines at work • To develop the employability of participating student • To avail an opportunities to eventually acquire job experiences
Course outcomes	After successful completion of this course, students are expected to: • Get actual work experience with office and virtual exposure to various management styles, technical, industrial, and procedural systems • Acquaint the knowledge related to working hours, work protocols and guidelines • Understand the roles and responsibilities of employee as well as team work • Justify job experiences that match their potentials, skills, and competencies
Internship An internship is a professional learning experience that offers meaningful, practical work related to a student's field of study or career interest. An internship gives a student the opportunity for career exploration and development, and to learn new skills. On the job training On the job training is a form of training provided at the workplace. During the training, employees are familiarized with the working environment they will become part of. Employees also get a hands-on experience using machinery, equipment, tools, materials, etc.	
Internship / OJT Procedure: 1. Pre-Approval: Students should seek approval from the college before starting the Internship / OJT. This ensures that the Internship / OJT aligns with the curriculum and meets the necessary criteria. 2. Mentor and Supervisor: Each student should have an assigned mentor at the organization/industry where they are interning. Additionally, an Internship / OJT supervisor from the college will be appointed to guide and monitor the progress. 3. Regular Reporting: Students should maintain regular communication with their supervisor and mentor, providing progress reports and seeking feedback. 4. Professional Conduct: Students must adhere to professional conduct throughout the Internship / OJT, including punctuality, respect for colleagues, and adherence to the organization's/industry's policies and guidelines. 5. Student Diary: Students should maintain a diary to document their experiences, challenges faced, and lessons learned during the Internship / OJT.	

6. **Final Report:** At the end of the Internship / OJT, students should submit a comprehensive final report, summarizing their accomplishments, contributions, and key takeaways.
7. **Evaluation:** The Internship / OJT is worth 4 credits (equivalent to 100 marks), and the evaluation will be divided into two categories: one by the mentor and the other by the Internship / OJT supervisor. The mentor's evaluation (internal examination) will carry 40 marks, and it will be based on the student's performance during the Internship / OJT. External examination will be conducted by mentor and supervisor which will be based on the student's diary, the final report prepared by the student, and their performance in the final viva voce, and will carry 60 marks. The total marks obtained by the students in both evaluations will be added together for the purpose of final evaluation. The evaluation of the students will be conducted by the mentor using the evaluation sheet provided by the college.

Internal Evaluation Criteria for Students by the Mentor:

1. **Quality of Work** (10 marks): How well did the student perform their assigned tasks during the Internship / OJT? Evaluate the accuracy, thoroughness, and attention to detail in their work.
2. **Initiative and Proactiveness** (10 marks): Did the student show initiative in taking on additional responsibilities or tasks beyond their assigned role? Did they demonstrate a proactive attitude towards problem-solving?
3. **Communication Skills** (10 marks): Assess the student's ability to communicate effectively with colleagues, superiors, and clients (if applicable). Consider both written and verbal communication.
4. **Problem-Solving Skills and Time Management** (10 marks): Evaluate the student's ability to analyze problems, propose solutions, and implement effective strategies to overcome challenges. How well did the student manage their time during the Internship / OJT? Were they able to meet project deadlines and handle multiple tasks efficiently?

External Evaluation Criteria for Students by the Supervisor and Mentor:

1. **Student Diary** (15 marks): Review the student's diary to understand their reflections, insights gained, and self-assessment of their performance during the Internship / OJT.
2. **Final Report** (15 marks): Evaluate the quality and comprehensiveness of the student's final report, including the clarity of their achievements and contributions.
3. **Presentation of Student in Viva Voce** (30 marks): Evaluate the responses given by the student to the questions asked by the faculty in the Viva Voce.

Evaluation Criteria for Final Viva Voce:

1. Presentation Skills
2. Knowledge of the Internship / OJT Project
3. Practical Application and Work Experience
4. Problem-Solving and Critical Thinking
5. Communication and Professionalism

SEMESTER-VI

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SEMESTER-VI

BCA-DSC-361 Cloud Computing

Total Hours: 30

Credits:2

Course objectives	• To introduce students to the basics of cloud computing, including its characteristics, evolution, service models, deployment models, benefits, and applications. • To provide knowledge about cloud computing architecture, virtualization types, hypervisors, and cloud storage techniques. • To equip students with an understanding of cloud service providers, resource management, scheduling, load balancing, scalability, and containerization. • To familiarize students with cloud security challenges, identity management, data privacy, cloud security standards, and advanced cloud technologies like edge computing and block chain.	
Course outcomes	After successful completion of this course, students are expected to: • Students will be able to describe the fundamentals of cloud computing, including service models, deployment models, and their real-world applications. • Students will demonstrate the ability to differentiate between various virtualization techniques and cloud storage mechanisms. • Students will be able to apply cloud resource management techniques, load balancing strategies, and containerization concepts. • Students will understand and implement cloud security measures while staying updated with the latest cloud computing advancements.	
Unit	Topic Particular	Hours
Unit I	Introduction to Cloud Computing • Definition and Characteristics of Cloud Computing • Evolution of Cloud Computing • Cloud Service Models: IaaS, PaaS, SaaS • Cloud Deployment Models: Public, Private, Hybrid, Community • Benefits and Challenges of Cloud Computing • Applications of Cloud Computing	07
Unit II	Cloud Architecture and Virtualization • Cloud Computing Architecture • Virtualization in Cloud Computing • Types of Virtualization: Hardware, Server, Storage, Network Virtualization • Hypervisors: Type 1 and Type 2 • Cloud Storage: Types and Techniques • Case Studies of Cloud Platforms (AWS, Azure, Google Cloud)	08

Unit III	Cloud Services and Resource Management • Cloud Service Providers and Offerings • Cloud Resource Management and Scheduling • Load Balancing in Cloud • Scalability and Elasticity in Cloud Computing • Containerization: Docker and Kubernetes • Cloud Monitoring and Performance Optimization	07
Unit IV	Security, Privacy, and Emerging Trends • Cloud Security Challenges and Solutions • Identity and Access Management (IAM) • Data Privacy and Compliance in Cloud • Cloud Security Standards and Best Practices • Edge Computing and Fog Computing • Future Trends in Cloud Computing (Serverless Computing, AI in Cloud, Blockchain in Cloud)	08
Study Resources	• Bahga, A., & Madisetti, V. (2014). Cloud computing: A hands-on approach. CreateSpace Independent Publishing Platform. • Buyya, R. (2011). Cloud computing: Principles and paradigms. Wiley. • Buyya, R., Vecchiola, C., & Selvi, S. T. (2013). Mastering cloud computing: Foundations and applications programming. Morgan Kaufmann. • Sodhi, B. S. (2017). Topics in Virtualization and Cloud Computing. IIT Ropar. • Kamal, R. (2017). Internet of Things: Architecture and Design Principles. McGraw-Hill Education.	

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SEMESTER- VI

BCA-DSC 362: Server Side Scripting using PHP

Total Hours: 30

Credits: 2

Course objectives	• Understand how server-side programming works on the web. • Creating conditional structures • How to receive and process form submission data. • Security tips	
Course outcomes	After successful completion of this course, students are expected to: • Knowledge of the structure and model of the PHP • Create an error-free simple PHP program • Demonstrates a working knowledge of Dynamic WebSite Design and Publishing • Offers a career differentiator, with enhanced credibility and marketability • Takes you beyond basic user's knowledge to the IT Pros who know how to create web sites	
Unit	Content	Hours
Unit I	Introduction to PHP • Web architecture, web Server (xampp Server, apache server) • History, Features & Drawbacks of PHP • The Basics of PHP • Data types in PHP, Structure & Syntax of PHP, • PHP with HTML, Comments, Variables, Literals, Operator, • Operator Precedence	7
Unit II	Flow Control Statements • Conditional Statements • Looping Statements • Exit, Return, Die, Include and Require Statements. • Types of strings in PHP, Comparing strings, • Manipulating and Searching strings, Regular Expressions	8
Unit III	Array, Function and String • Index Vs Associative Array, Multidimensional Array, Different array function in PHP • Introduction to Function- Defining and Calling a function, • Scope of variables in function, Function Parameters, Returning Values from a function, • Recursive Functions	7
Unit IV	PHP class • Creating a Class, Object, Adding a Method, Properties • Visibility (Public, Private and Protected).- Object-Oriented PHP • Constructor and Destructors • Abstract classes, Final classes • Inheritance, Interfaces • Exception handling.	8

Study Resources	• PHP 5.1 for Beginners, Ivan Bayross and Sharnam Shah, SPD Publication • Beginning PHP5 Dave Mercer et al. Wrox Press • PHP for Beginners [Book] / auth. Ivan Bayross, Sharnam Shah, THE X Team. • “PHP: A Beginner’s Guide” by Vikram Vaswani • “Learning PHP 5” by David Sklar • “PHP Object – Oriented Solutions” by David Powers • “Build Your Own Database Driven Web Site Using PHP & MySQL” by Kevin Yank • “PHP Programming For Beginners: The Simple Guide to Learning PHP Fast!” by Tim Warren • “PHP for the Web: Visual QuickStart Guide” by Larry Ullman • “Programming PHP: Creating Dynamic Web Pages” by Kevin Tatroe and Peter MacIntyre • PHP & MySQL Novice to Ninja – by Kevin Yank	
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T.Y.BCA
SEMESTER- VI
BCA-DSC-363: Python Programming-II

Total Hours: 30

Credits: 2

Course objectives	- To learn how to design and program Python applications. - To develop problem solving skills and their implementation through Python. - Master the fundamentals of writing Python scripts - To develop the ability to write database applications in Python	
Course outcomes	After successful completion of this course, students are expected to: - Explain basic principles of Python programming language - Implement object oriented concepts, database applications. - Construct regular expressions for pattern matching and apply them to various filters for a specific task. - Design and implement Database Application and Content providers - Apply the best features of mathematics, engineering and natural sciences to program real life problems.	
Unit	Content	Hours
Unit I	Object Oriented Concepts in Python - Overview of OOP Terminology - Creating Classes - Creating Instance Objects - Accessing Attributes - Built-In Class Attributes - Garbage Collection: Constructor - Overloading Methods and Operator - Inheritance - Implementing a subclass, Overriding Methods	7
Unit II	Python Exception Handling and Regular Expression - Introduction - Syntax Error - Handling Exception - Multiple Except Clauses - try...finally - Raising Exception - User Defined Exception - List of Standard Exception - Regular Expression	8
Unit III	File Handling in Python - File Objects, - Writing Text Files, - Appending Text to a File, - Reading Text Files, - File Exceptions, - Paths and Directories, - Exceptions in os, Paths, - Directory Contents, - Obtaining Information about Files, Renaming, Moving, Copying, and	7

	Removing Files, • Creating and Removing Directories, Globbing	
Unit IV	GUI with Python • GUI Programming Toolkits for Python, Tkinter Introduction, • Creating GUI Widgets with Tkinter, • Resizing the Widget, • Creating Layouts, Packing Order, • Controlling Widget Appearances, Radio Buttons and Checkboxes, Dialog Boxes. Python with MySQL • Introduction to MySQL • Installing MySQL Driver - MySQL Connector or MySQLdb • MySQL Database connection with Python • Creating Database in MySQL using Python • Create a Table in MySQL with Python • Insert, Select, Update and Delete Operation in MySQL with Python • COMMIT Operation • ROLLBACK Operation • Disconnecting Database	8
Study Resources	• John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hall of India, 2013, ISBN: 9780262525008 • Peter C. Norton, Alex Samuel and others, —Beginning Python, Wrox Publication, 2005 ISBN 10: 0764596543 ISBN 1 • R. NageswaraRao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427 • Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN13: 978-0132269933, ISBN-10: 0132269937 • Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Python”, Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118- 29027-9(HardCover) • Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705 • Luke Sneeringer(2015), Professional Python, Wiley Inc., 2015, ISBN: 1119070856	

T.Y.BCA

SEMESTER- VI

BCA-DSC-364 Computer Network

Total Hours: 30

Credits:2

Course objectives	• To provide fundamental understanding of computer networks, their types, topologies, and the OSI and TCP/IP models. • To introduce students to essential network devices, transmission media, and IP addressing concepts, including subnetting and supernetting. • To explain various data transmission techniques, error detection and correction methods, and networking protocols such as HTTP, FTP, TCP, and IP. • To introduce students to key concepts of network security, including firewalls, VPNs, cryptography, and wireless network security.	
Course outcomes	• To describe the fundamentals of computer networks, including their advantages, classifications, and architectural models. • To identify different network devices, compare transmission media, and perform IP addressing, subnetting, and supernetting. • To demonstrate knowledge of data encoding, error detection, switching techniques, and essential networking protocols used in modern communication. • To understand and apply basic security mechanisms such as firewalls, encryption, and digital signatures to protect network data.	
Unit	Topic Particular	Hours
Unit I	Introduction to Computer Networks • Basics of Computer Networks • Advantages of computer networking • Types of Networks (LAN, WAN, MAN) • Network Topologies (Star, Bus, Ring, Mesh, Hybrid) • OSI and TCP/IP Models • Introduction to Internet – ARPANET, Architecture of Internet, Client server model, www	07
Unit II	Network Devices and Communication • Network Devices (Hub, Switch, Router, Gateway, Repeater, Modem) • Transmission Media (Wired & Wireless) • IP Addressing (IPv4, IPv6) • Subnetting and Supernetting • Analog and Digital, digital data transmission – parallel transmission, serial transmission	08

Unit III	Data Transmission and Protocols • Data Encoding and Transmission Modes • Error Detection and Correction Techniques • Switching Techniques (Circuit, Packet, Message Switching) • Protocols (HTTP, FTP, SMTP, POP3, DHCP, DNS,IP,TCP,ARP)	07
Unit IV	Network Security • Network Security Basics, importance network security, • Firewalls, VPNs. • Cryptography-Traditional Ciphers, Simple modern Ciphers, Asymmetric Key ,Digital Signatures, Wireless and Mobile Networks	08
Study Resources	• Kumar, S., & Ojha, A. (2023). Computer Networks: Principles, Protocols, and Practice. San International Scientific Publication. • Forouzan, B. A. (2023). Computer Networks: A Top-Down Approach. McGraw Hill Education (India) Private Limited. • Katre, J. S. (2023). <i>Computer Network</i>. TechKnowledge Publications. • Jain, V. K. (2017). <i>Cryptography and Network Security</i>. Khanna Publishing House. • Kundu, S. (2014). <i>Fundamentals of Computer Networks</i>. PHI Learning. • Kahate, A. (2013). <i>Cryptography and Network Security</i>. Tata McGraw-Hill Education.	

T.Y.BCA
SEMESTER- VI

BCA-DSC-365 Evolution of Computing in India

Total Hours: 30

Credits: 2

Course Objectives	The learner will be able to - gain insights into the historical contributions and advancements in computing science from ancient Indian civilizations. - explore and understand key contributions to computing during the 19th century, shaping the foundation of modern computational theory and technology. - understand the impact of government policies on the IT industry and assess the current status and trends within the sector.	
Course Outcomes	After successful completion of this course, students are expected to: - achieve the knowledge about the history of computing in Indian civilization. - know the impact of computing in the foundation of modern computational theory. - Analyze the impact of government the policies on IT industry.	
Unit	Contents	Hours
Unit I	Computing Science in Ancient India - An overview of Ancient Indian Science - Vedic Cognitive science, mathematical and physical science, - Scientist of ancient India, Binary numbers in Indian Antiquity - Pingala's classification of Meters, - Encode decode system in Ancient India-Katayapadi Scheme, - Panini's contribution in computing -The Panini-Backus Form, Fowlers' automaton.	
Unit II	Contribution in Computing in 19th Century - Laying the foundation, First computer in India, - TIFRAC, Self-reliant growth of computer industry, - ECIL's computer division, - PARAM super computer, - NASSCOM, Contribution of CDAC, - Development of multilingual software. Indian computer scientist, Indian IT industrialist.	
Unit III	Government Policies - Economy of India, Government initiative - Role of government institution & Ministry of Information Technology - Government Policies at early stage and revised policies - Consequences of Government policies.	
Unit IV	Status of IT industry - Entry of private sector in computer industry - Liberalization of economy and software expert growth - The period of rapid growth of IT industry	

	• Indian IT industry in global perspective • Indian ICT industry in global perspective • Future of IT industry	
Study Resources	• “Computing science in Ancient India”, T.R.N. Rao / Subhash Kak • “History of Computing in India 1955-2010”, V. Rajaraman, IEEE Computer Society • “Homi Bhabha and the Computer Revolution”, R.K. Shyamsunder and M. A. Pai, Oxford University, 2011 • Additional references: • https://www.scribd.com/document/57187049/History-of-Computer-Technology-in-India# • https://en.m.wikipedia.org/wiki/TCIFRAC • https://en.m.wikipedia.org/wiki/Information_technology_in_India	

T.Y.BCA

SEMESTER-VI

BCA-DSC 366: Practical on Server Side Scripting using PHP

Total Hours: 60

Credits: 2

Batch Size:12

Course objectives	• To study the fundamental data analysis • Learn to build and maintain reliable, scalable, distributed systems • To describe Data Visualization	
Course outcomes	After successful completion of this course, students are expected to: • By the end of the course students will be able to • Students will learn injecting data • Data processing and data quality • They will able to learn distributed systems	
	Content	Hours
1	Write a PHP program to check palindrome number.	4
2	Write PHP scripts that demonstrate Fibonacci series.	4
3	Write PHP scripts that demonstrate fundamentals PHP Number triangle.	4
4	Write a PHP program to swap two numbers with and without using third variable.	4
5	To find sum of digits of a number just add all the digits.	4
6	To find sum of digits of a number just add all the digits.	4
7	Write PHP script that will display grade based on criteria given below using the marks obtained in Examination. a. Distinction (70 and above) b. First Class (60 - 69) c. Pass (40 - 59) d. Fail (below 40)	4
8	Write a PHP script to demonstrate different String functions.	4
9	Write a PHP script to demonstrate conditional assignment operator: Ternary(?:)	4
10	Write a PHP program to check armstrong number.	4
11	Write a PHP script to Demonstrate OOPS Concept in PHP.	4
12	Write a PHP script to demonstrate Form Data Handling using Get and Post methods.	4
13	Design a database in MYSQL. Create table in database. Store, Update, Delete and Retrieve data from the table. Display the data from the table.	4
14	Write a PHP script to store, retrieve and delete cookies on your local machine.	4
15	Write a PHP script to store, retrieve and delete data using session variables.	4
Study	• “PHP: A Beginner’s Guide” by Vikram Vaswani	

Resources	• “Learning PHP 5” by David Sklar • “PHP Object – Oriented Solutions” by David Powers • “Build Your Own Database Driven Web Site Using PHP & MySQL” by Kevin Yank • “PHP Programming For Beginners: The Simple Guide to Learning PHP Fast!” by Tim Warren • “PHP for the Web: Visual QuickStart Guide” by Larry Ullman • PHP & MySQL Novice to Ninja – by Kevin Yank	
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**T.Y.BCA
SEMESTER-VI**

BCA- DSC-367 : Practical on Python Programming-II

Total Hours: 60

Credits: 2

Batch Size:12

Course objectives	• Learn Python syntax, data types, and control structures. • Develop problem-solving skills using loops and functions. • Understand object-oriented programming (OOP) concepts. • Explore Python libraries for real-world applications.	
Course outcomes	After successful completion of this course, students are expected to: • Write and debug Python programs efficiently. • Implement logic using loops, functions, and decision-making. • Apply OOP concepts like classes and inheritance. • Handle files and manipulate data using Python libraries. • Develop small applications using Python tools and frameworks. Instruction: At the time of Practical you can use any Python IDEs and Code Editors• (PyCharm, Spyder, Thonny, etc.).	
	Content	Hours
1	Create a Python class with attributes and methods, instantiate objects, and access attributes.	4
2	Implement method overloading and operator overloading in Python.	4
3	Demonstrate inheritance and method overriding in Python.	4
4	Create a user-defined exception class and handle exceptions.	4
5	Use regular expressions to validate email addresses and phone numbers.	4
6	Write a program to create, read, write, and append to a text file.	4
7	Implement a script to list all files in a directory and obtain file details.	4
8	Develop a Python program to copy, move, rename, and delete files using shutil and os modules.	4
9	Design a simple GUI application using Tkinter with buttons, labels, and text input.	4
10	Implement radio buttons and checkboxes in a Tkinter application.	4
11	Create a basic calculator using Tkinter.	4
12	Connect Python with MySQL and create a database.	4
13	Perform INSERT, SELECT, UPDATE, and DELETE operations in MySQL using Python.	4
14	Write a Python program to handle transactions with COMMIT.	4
15	Write a Python program to handle transactions with ROLLBACK.	4
Study Resources	• Peter C. Norton, Alex Samuel and others, —Beginning Python, Wrox Publication, 2005 ISBN 10: 0764596543 ISBN 1	

	• R. NageswaraRao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427 • Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN13: 978-0132269933, ISBN-10: 0132269937 • Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Pyhon”, Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118- 29027-9(HardCover) • Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705	
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T.Y.BCA

SEMESTER-V

BCA-DSE-361 (A): Machine Learning

Total Hours: 30

Credits: 2

Course objectives	• Understand the basics of Machine Learning and its significance. • Make use of Data sets in implementing the machine learning algorithms • Explore emerging trends in Machine Learning. • Learn different classification and clustering algorithms.	
Course outcomes	After successful completion of this course, students are expected to: • To able to define ML and its key concepts. • To able to clean and preprocess raw data. • To implement ML models for classification and clustering tasks. • Implement the machine learning concepts and algorithms in any suitable language of choice.	
Unit	Content	Hours
Unit I	Introduction to Machine Learning • Introduction to Machine Learning, Types of Machine Learning (Supervised, Unsupervised, Reinforcement) • Applications of Machine Learning in Real Life • Challenges and Limitations of Machine Learning • Basic Terminologies in ML (Model, Features, Labels, Training, Testing)	7
Unit II	Data Preprocessing and Feature Engineering • Understanding Data: Structured vs. Unstructured Data • Data Cleaning: Handling Missing and Noisy Data • Feature Selection and Feature Engineering • Normalization and Standardization • Splitting Data: Training, Testing, and Validation Sets	8
Unit III	Supervised and Unsupervised Learning • Introduction to Supervised Learning (Regression and Classification) • Decision Trees, Random Forests, and Support Vector Machines • Introduction to Unsupervised Learning (Clustering and Association) • K-Means Clustering and Hierarchical Clustering • Performance Evaluation: Confusion Matrix, Precision, Recall, F1-Score	7
Unit IV	Machine Learning Tools and Future Trends • Introduction to Popular ML Libraries (Scikit-Learn, TensorFlow, PyTorch) • Building a Simple ML Model Using Python • Ethical Considerations in Machine Learning • AutoML and No-Code ML Platforms • Future Trends in ML (Explainable AI, Quantum ML, Edge AI)	8
Study Resources	• Prasad, B. (2020). Machine learning with Python. BPB Publications. • Sharma, G. (2019). Design & Analysis of Algorithms. Khanna Book Publishing Co. • Jain, R., & Dixit, A. (2019). Machine learning: Algorithms and applications. BPB Publications.	

	• Jain, V. K. (2018). Machine Learning. Khanna Book Publishing Co. • Chopra, R. (2018). Deep Learning: A Practitioner's Approach. Khanna Book Publishing Co. • Kahate, A. (2013). Cryptography and Network Security. Tata McGraw-Hill Education	
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T.Y.BCA

SEMESTER-VI

BCA- DSE -361 (B) : Digital Image Processing-II

Total Hours: 30

Credits: 2

Course objectives	To understand and learn: • To equip students with the fundamental knowledge and basic technical competence in the field of Computer Graphics and Digital Image Processing. • To provide an understanding of how to scan convert the basic geometrical primitives, basic principles of 2 and 3- dimensional computer graphics. • To be able to discuss the application of computer graphics concepts in the development of information visualization, and business applications • Give an in-depth knowledge about the basic theory and algorithms related to Digital Image Processing	
Course outcomes	After successful completion of this course, students are expected to: • Develop scientific and strategic approach to solve complex problems Computer in the domain of Computer Graphics and Digital Image Processing. • Demonstrate various algorithms for scan conversion and filling of basic primitives objects and their comparative analysis and applied 2-D and 3-D geometric transformations, viewing and clipping on graphical objects. • Built the mathematical foundations for digital image representation, image acquisition, image transformation, image enhancement and restoration. • Develop a theoretical foundation of fundamental concepts of digital image processing.	
Unit	Content	Hours
Unit I	Advanced Image Representation & Analysis • Multispectral and Hyperspectral Imaging • Image Compression Techniques and Standards • Morphological Image Processing • Edge Detection and Feature Extraction • Image Segmentation Techniques • Texture Analysis and Feature Descriptors • 3D Image Processing and Reconstruction • High-Dimensional Image Representation	7
Unit II	Machine Learning & AI in Image Processing • Introduction to Deep Learning for Image Processing • Convolutional Neural Networks (CNNs) for Image Recognition • Object Detection and Recognition • Image Captioning and Scene Understanding • Image-to-Image Translation • GANs for Image Generation and Enhancement • Anomaly Detection in Images • Transfer Learning in Image Processing	8

Unit III	Biomedical & Industrial Applications • Medical Image Processing and Analysis • Image Processing in Remote Sensing • Industrial Quality Control using Image Processing • Face Recognition and Biometric Applications • Image Processing in Autonomous Vehicles • Optical Character Recognition (OCR) • Image-Based Augmented Reality Applications • Image Processing for Surveillance and Security	7
Unit IV	Advanced Image Transformations & Filtering • Discrete Wavelet Transform (DWT) and Applications • Curvelet and Ridgelet Transforms • Steerable Filters and Oriented Filtering • Adaptive Filtering in Image Processing • Super-Resolution Imaging Techniques • Image Fusion Methods • Compressive Sensing for Image Reconstruction • Motion Analysis and Optical Flow Estimation	8
Study Resources	• S. S. Bedi & Rati Sahu (2020). <i>A guide to digital image processing</i>. BPB Publications. • Pankaj Rohatgi & Anil Kumar (2019). <i>Fundamentals of digital image processing</i> (1st ed.). Vikas Publishing. • Hiranmay Ghosh (2018). <i>Advances in image processing techniques</i>. Universities Press (India) Pvt. Ltd. • A.K. Jain (2015). <i>Fundamentals of digital image processing</i>. McGraw Hill Education India. • S. Sridhar (2011). <i>Digital image processing</i> (1st ed.). Oxford University Press India.	

T.Y.BCA

SEMESTER-VI

BCA-DSE 362 A : Practical on Machine Learning using Python

Total Hours: 30

Credits: 2

Batch Size: 12

Course objectives	• Understand the basics of Machine Learning and its significance. • Make use of Data sets in implementing the machine learning algorithms • Explore emerging trends in Machine Learning. • Learn different classification and clustering algorithms.	
Course outcomes	After successful completion of this course, students are expected to: • To able to define ML and its key concepts. • To able to clean and preprocess raw data. • To implement ML models for classification and clustering tasks. • Implement the machine learning concepts and algorithms in any suitable language of choice.	
	Content	Hours
1	Write a Python program to check if a number is even or odd.	4
2	Implement a Python script to calculate the accuracy of a simple classification model.	4
3	Create a program to fetch real-world data from an API (e.g., weather data).	4
4	Write a Python program to read and display a CSV dataset using Pandas.	4
5	Normalize a dataset using Min-Max scaling with Scikit-learn.	4
6	Split a dataset into training and testing sets using Scikit-learn.	4
7	Implement a simple Linear Regression model using Scikit-learn.	4
8	Build a Decision Tree classifier for classifying Iris flower species.	4
9	Implement a K-Nearest Neighbors (KNN) classifier on a sample dataset.	4
10	Write a Python script to implement K-Means clustering on a dataset.	4
11	Use the elbow method to find the optimal number of clusters in K-Means.	4
12	Implement a simple Python script to plot data using Matplotlib.	4
13	Implement a basic spam detection system using a dataset.	4
14	Create a simple chatbot using Python's if-else conditions.	4
15	Train a basic image classification model using Google Teachable Machine	4
Study Resources	• Prasad, B. (2020). Machine learning with Python. BPB Publications. • Sharma, G. (2019). Design & Analysis of Algorithms. Khanna Book Publishing Co. • Jain, V. K. (2018). Machine Learning. Khanna Book Publishing Co. • Chopra, R. (2018). Deep Learning: A Practitioner's Approach. Khanna Book Publishing Co. • Kahate, A. (2013). Cryptography and Network Security. Tata McGraw-Hill Education	

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SEMESTER-VI

BCA- DSE -362B : Practical on Digital Image Processing-II

Total Hours: 60

Credits: 2

Batch Size:12

Course Objectives	To understand and learn: • Understand the internal layout and components of a computer system, including SMPS, motherboard, RAM, HDD, and various ports. • Develop skills in identifying hardware specifications and troubleshooting common hardware problems related to RAM, SMPS, and the motherboard. • Learn how to configure BIOS settings and install additional hardware components like RAM. • Acquire hands-on experience in assembling a PC and installing software, such as operating systems and printers.	
Course Outcomes	After successful completion of this course, students are expected to: • Identify and understand the layout of major hardware components within a computer system, such as the motherboard and various ports. • Diagnose and troubleshoot hardware issues, particularly with RAM, SMPS, and the motherboard, and identify the hardware specifications of a computer. • Demonstrate the ability to configure BIOS settings for USB and LAN functionality and expand system memory by adding additional RAM. • Install and configure operating systems and peripheral devices, including setting up a printer and resolving related issues.	
Sr. No.	Content	Hours
1	Perform image compression using JPEG and PNG formats.	4
2	Draw Shapes on an Image – Add lines, circles, or rectangles using OpenCV.	4
3	Crop a Part of an Image – Extract a specific region from an image.	4
4	Detect Edges in an Image – Use the Canny edge detection method.	4
5	Change Image Contrast – Increase or decrease image contrast using OpenCV.	4
6	Merge Two Images – Blend two images using weighted addition.	4
7	Extract a Specific Color from an Image – Detect and highlight a particular color	4
8	Display the histogram to analyze brightness levels.	4
9	Apply morphological operations for noise removal in images.	4
10	Train a CNN model for object classification.	4
11	Enhance low-contrast images using histogram equalization.	4

12	Extract features from an image using HOG and SIFT descriptors.	4
13	Apply Fourier Transform for frequency domain filtering.	4
14	Implement face recognition using OpenCV and deep learning.	4
15	Perform image denoising using Gaussian and median filters.	4
Study Resources	• Sonka, M., Hlavac, V., & Boyle, R. (2014). Image processing, analysis and machine vision (4th ed.). Cengage Learning • Bhabatosh Chanda & Dwijesh Dutta Majumder (2011). Digital image processing and analysis (2nd ed.). PHI Learning Pvt. Ltd. • S. Annadurai & R. Shanmugalakshmi (2007). Fundamentals of digital image processing. Pearson Education India. • U. Rajendra Acharya, Choo Min Lim, Jasjit S. Suri (2005). Image processing techniques for medical applications. CRC Press India. • Burger, W., & Burge, M. J. (2016). Digital image processing: An algorithmic approach with MATLAB (2nd ed.). Springer.	

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SEMESTER-VI

BCA-VSC-361: R Programming

Total Hours: 30

Credits:2

Course objectives	• To introduce students to the basics of R programming. • To develop skills in data handling, manipulation, and importing/exporting datasets using R. • To enable students to visualize data and perform basic statistical analysis using R. • To familiarize students with advanced R applications.	
Course outcomes	• Students will be able to write basic R programs and implement control structures. • Students will be proficient in handling various data structures such as vectors, matrices, and data frames. • Students will be able to create data visualizations and apply statistical methods for data analysis. • Students will be capable of implementing regression models, time series analysis, and web-based applications using R.	
Unit	Topic Particular	Hours
Unit I	Basics of R • Write an R program to print "Hello, World!" • Perform basic arithmetic operations in R. • Create and use variables of different data types (numeric, character, logical). • Implement control structures (if-else, for loop, while loop). • Write a function to calculate the factorial of a number.	07
Unit II	Data Handling in R • Create a vector and perform basic operations (addition, sorting, filtering). • Create a list containing different data types and access its elements. • Create a matrix and perform matrix addition and multiplication. • Create a data frame and perform basic operations (add, delete, modify rows/columns). • Import a CSV file into R and display its contents.	08
Unit III	Visualization and Statistics • Create a bar chart for given data using ggplot2. • Plot a line graph for time-series data. • Draw a histogram for a given dataset. • Compute mean, median, and standard deviation of a dataset. • Perform correlation analysis between two variables.	07

Unit IV	Advanced Topics • Implement simple linear regression on a dataset. • Perform time series analysis on stock price data. • Extract data from a webpage using web scraping in R. • Create a basic interactive dashboard using R Shiny. • Build a simple machine learning model using R (linear regression).	08
Study Resources	• "R for Data Science", Hadley Wickham & Garrett Grolemund, O'Reilly Media, 1st Edition (2017) • "The Art of R Programming", Norman Matloff, No Starch Press, 1st Edition (2011) • "Hands-On Programming with R", Garrett Grolemund, O'Reilly Media, 1st Edition (2014) • "R in Action", Robert Kabacoff, Manning Publications, 3rd Edition (2022) • "ggplot2: Elegant Graphics for Data Analysis", Hadley Wickham, Springer, 2nd Edition (2016)	

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SEMESTER-VI

BCA-VSC-362: Practical on R Programming

Total Hours: 60

Credits: 2

Batch Size:12

Course objectives	- To Study R Software for Statistical Analysis. - To Study Basics of R.	
Course outcomes	- To understand downloading and Installation of R. - Usage of R for Statistical data analysis.	
Sr.No	Topic Particular	Hours
1	Write an R program to print "Hello, World!"	4
2	Perform basic arithmetic operations in R.	4
3	Create and use variables of different data types (numeric, character, logical).	4
4	Implement control structures (if-else, for loop, while loop).	4
5	Write a function to calculate the factorial of a number.	4
6	Create a vector and perform basic operations (addition, sorting, filtering).	4
7	Create a list containing different data types and access its elements.	4
8	Create a matrix and perform matrix addition and multiplication.	4
9	Create a data frame and perform basic operations (add, delete, modify rows /columns).	4
10	Import a CSV file into R and display its contents.	4
11	Create a bar chart for given data using ggplot2 .	4
12	Plot a line graph for time-series data.	4
13	Draw a histogram for a given dataset.	4
14	Compute mean, median, and standard deviation of a dataset.	4
15	Perform correlation analysis between two variables.	4
Study Resources	"R for Data Science", Hadley Wickham & Garrett Grolemund, O'Reilly Media, 1st Edition (2017) "The Art of R Programming", Norman Matloff, No Starch Press, 1st Edition (2011) "Hands-On Programming with R", Garrett Grolemund, O'Reilly Media, 1st Edition (2014) "R in Action", Robert Kabacoff, Manning Publications, 3rd Edition (2022) "ggplot2: Elegant Graphics for Data Analysis", Hadley Wickham, Springer, 2nd Edition (2016)	