J. C. Bose University of Science and Technology, YMCA,

Faridabad, Haryana

Department of Computer Science & Applications
(Faculty of Informatics and Computing)

Scheme and Syllabus

BCA

(Semester V – VIII)

W.e.f. 2025

(The Proposed Syllabus is approved in the 9th Meeting of BOS held on 18.03.25).

Scheme

(Semester V to VIII)

BCA Scheme of Studies
Semester– V

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCG-301-V	JAVA Programming	3	-	3	25	75	100	3
2	Discipline Specific-Major	CEU-314-V	Software Engineering	3		3	25	75	100	3
3	Discipline Specific-Major	BCG-305-V	Analysis of Design and Algorithms	3	-	3	25	75	100	3
4	Discipline Specific-Major		Elective -I	3	-	3	25	75	100	3
5	Discipline Specific-Minor	EEU-322-V	Speech and Audio Processing	4	-	4	25	75	100	4
6	Discipline Specific Lab	BCG-309-V	Java Lab	-	2	2	15	35	50	1
7	Discipline Specific Lab	BCG-311-V	Analysis of Design and Algorithms Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCG-313-V	Internship or minor project	-	4	4	50	50	100	2
			Total			**24**	**205**	**495**	**700**	**20**

Elective-I

- **BCG-321-V:** Machine Learning-1
- **BCG-323-V:** User Interface Design
- **BCG-325-V:** Digital Image Processing

Note* :Every student has to qualify three MOOC courses during the period of the course i.e. from Semester 1st to Semester 8th at any time (Applicable to 4 year degree programme) and the credit will be counted in the 8th semester only.

BCA Scheme of Studies
Semester– VI

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCG-302-V	C# Programming	3		3	25	75	100	3
2	Discipline Specific-Major	BCG-304-V	Big Data-I	3	-	3	25	75	100	3
3	Discipline Specific-Major	BCG-306-V	Data Warehousing and Data Mining	3	-	3	25	75	100	3
4	Discipline Specific-Major		Elective-II	3	-	3	25	75	100	3
5	Discipline Specific-Minor	OEU-238-V	High Speed Networks	4		4	25	75	100	4
6	Discipline Specific Lab	BCG-310-V	C# Lab	-	2	2	15	35	50	1
7	Discipline Specific Lab	BCG-312-V	Big Data-I Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCG-314-V	Data Warehousing and Data Mining Lab	-	2	2	15	35	50	1
			Total			**22**	**170**	**480**	**650**	**19**

Elective-II

- BCG-320-V: Machine Learning-II
- BCG-322-V : Software Testing and Quality Assurance
- AMU-304-V **:** User Experience Design

Note* :Every student has to qualify three MOOC courses during the period of the course i.e. from Semester 1st to Semester 8th at any time (Applicable to 4 year degree programme) and the credit will be counted in the 8th semester only.

BCA Scheme of Studies
(BCA) - VII Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCG-401-V	Research Methodology	3		3	25	75	100	3
2	Discipline Specific-Major	BCG-403-V	BIG DATA- II	3	-	3	25	75	100	3
3	Discipline Specific-Major	BCG-405-V	Cloud Computing	4	-	4	25	75	100	4
4	Discipline Specific-Major	BCG-407-V	Information Security and Cyber Law	4	-	4	25	75	100	4
5	Discipline Specific-Major		Elective -III	4		4	25	75	100	4
6	Discipline Specific-Minor	BCG-409-V	Embedded System	4		4	25	75	100	4
7	Skill Enhancement Course	BCG-411-V	BIG DATA II - Lab	-	2	2	15	35	50	1
8	Skill Enhancement Course		Lab Based on Elective-III	-	2	2	15	35	50	1
Total						26	180	520	700	24

Elective -III

1. BCG-421-V: Computer Vision
2. BCG-423-V: Agile Methodologies and JIRA
3. BCG-425-V: Virtual Reality and Augmented Reality

Lab Based on Elective-III

1. BCG-431-V: Computer Vision Lab. Virtual Reality and Augmented Reality Lab
2. BCG-433-V: Agile Methodologies and JIRA Lab.
3. BCG-435-V: Virtual Reality and Augmented Reality Lab

Note* :Every student has to qualify three MOOC courses during the period of the course i.e. from Semester 1st to Semester 8th at any time (Applicable to 4 year degree programme) and the credit will be counted in the 8th semester only.

BCA Scheme of Studies
BCA - VIII Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCG-402-V	Research Project/Dissertation/Industrial Internship*	-	-	-	300	200	500	15
2	Discipline Specific-Major		MOOC -1	-	-	-	-	-	-	3
3	Discipline Specific-Major		MOOC -2	-	-	-	-	-	-	
4	Discipline Specific-Minor		MOOC -3	-		-	-	-	-	
Total							300	200	500	24

***Note:**

4. Major Project: Industrial Internship/Research Project /Dissertation/ Teaching Assistantship in the same or another institution.
5. Students who will opt for a Research Project/Dissertation of 6 months will do two Discipline Specific Major Courses and one Discipline Specific minor course through MOOC and these will be awarded BCA with Honors with Research. These three MOOC courses can be qualified/completed during the 1st to 8th semester.
6. Students who will opt for a simple industrial internship of 6 months will also do two Discipline Specific Major Courses and one Discipline Specific minor course through MOOC and these students will be awarded BCA with Honors. These three MOOC courses can be qualified/completed anytime during the 1st to 8th semester.
7. The selection of MOOC courses in any semester will be done after due permission from the department.
8. Assessment End Term and sessional exam in semester VIII will be done as per the following practices.
   A. End-term Exam Marks

Evaluation	50 Marks
Seminar	50 Marks
Viva	100 Marks

   B. Sessional Marks (Continuous assessment)

Assessment by Institute Faculty	100 Marks
Assessment by Guide	150 Marks
Conduct Marks	50 Marks
TOTAL	500 Marks

SEMESTER V

BCG-301-V
JAVA Programming
BCA-V Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To learn basics of JAVA programming and its basic concepts and syntax.
2 To implement program using inheritance and polymorphism.
3 To learn the concept of exception handling, and use of threading etc.
4 To learn file I/O and be able to apply object oriented or non-object oriented techniques to solve bigger Real World Computing problems.

Syllabus:

Unit I: Java Language Basics

Introduction to Java, Basic Features, Java Virtual Machine Architecture and Concepts, Primitive Data Type and Variables, Java Operators, Expressions, Statements and Arrays.

Unit II: Classes, Inheritance and Polymorphism

Classes, objects; array of objects; objects as function arguments, scope resolution operator, static data members, inheritances, types of inheritance, containership, constructors and their types, polymorphism, abstract class, interface and packages.

Unit III Exceptions and Multithreading

Exception handling: exception handling in JAVA 'tries and catch, throw and catch, throws and catch blocks', multiple throw and catch blocks, throwing objects, exception classes, user defined exception.
Multithreading: Concept of process and thread, life cycle of a thread, user defined thread creation through class and through interface, deciding priority in threads, synchronization in threads: producer-consumer problem.

Unit IV: I/O in JAVA

I/O Basics, Type of Streams and Stream Classes, The Predefined Streams, reading from and Writing to Console, Reading and Writing Files, Object Serialization.

Course Outcomes:

A student will be able to:

CO1: Understand and apply the basic concept of the Java and implement program using proper syntax and applying the various features of the language.
CO2: Apply the OOPs concepts like inheritance, Data Abstraction and polymorphism.
CO3: Implement program using threads and exception handling.
CO4: Handle I/O while solving the real-life problems.

Text/ Reference Books:

1 H M Deitel and P J Deitel, "C++ How to Program". by Pearson Education.
2 Robert Lafore, "Object Oriented Programming in Turbo C++", The WAITE Group Press, 1994.
3 E Balagurusamy, "Programming in Java", McGraw Hill.
4 Herbert Schildt, "The Complete Reference JAVA, TMH Publication".
5 Ivor Horton, "Begining JAVA", WROX Public.
6 Stephen Potts, "JAVA 2 UNLEASHED", Tech Media Publications.
7 Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference", 1999, TMH.

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CEU-314-V
Software Engineering
BCA-V Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand need of software engineering and fundamental principles of Software Engineering and SRS designs principles.
2 To understand various software project concepts and how project planning is done using various phases.
3 To understand the various techniques for software design.
4 To understand the various techniques for testing the software.

Syllabus:

Unit I: Introduction and Software Requirement

Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.
Requirement engineering, requirement elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Unit II: Software Project Management Concepts and Software Project Planning

The Management spectrum, The People, The Problem, The Process, The Project, Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, McCabe cyclomatic complexity, Risk Management.

Unit III: Software Design

Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics.

Unit IV: Software Testing

Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing, Debugging Activities.

Course Outcomes:

A student will be able to:

CO1: Analyze why software engineering is needed to develop quality software.
CO2: Design software requirement specification document is built.
CO3: Apply the coupling between modules and how software design is done.
CO4: Implement various software testing techniques to test the software at each level of software development.

Text/ Reference Books:

1 Pressman, "Software Engineering", TMH.
2 K.K Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers.
3 Jalote, Pankaj, "An Integrated Approach to Software Engineering", Narosa Publications.
4 Lewis, T.G, "Software Egineering", McGraw-Hill.
5 Shere, "Software Engineering & Management", Prentice Hall.
6 Fairely, R.E., "Software Engineering Concepts", McGraw-Hill.

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BCG-305-V
Analysis of Design and Algorithms
BCA-V Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To study mathematical preliminaries required to analyze and design computer algorithms and understand advanced data structures required to design efficient computer algorithms.
2 To make understand students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc.
3 Use various techniques for efficient algorithm design (divide-and-conquer, greedy) and are able to apply them while designing algorithms.
4 Use various techniques for efficient algorithm design (dynamic programming, backtracking) and are able to apply them while designing algorithms.

Syllabus:

Unit I: Introduction and Divide and Conquer Approach

Basic characteristics of algorithm, Empirical and analytical analysis of algorithms, analysis of algorithms, in terms of space and time complexity and Asymptotic notations- binary search, ternary search algorithm, merge sort, quick sort, selection, strassen's matrix multiplication.

Unit II: Analysis of Greedy Methods

Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths, the travelling salesman problem, optimal storage on tapes, optimal merge patterns and analysis of these problems.

Unit III: Dynamic Programming

General method, single source shortest path, all pair shortest path, optimal binary search trees, 0/1 knapsack, the travelling salesman problem.

Unit IV: Back Tracking

General method of backtracking, 8 queen's problem, graph coloring, sum of subsets, Hamiltonian cycles, analysis of these problems.

Course Outcomes:

A student will be able to:

CO1: Analyze and compare complexity for different types of algorithms for different types of problems and apply mathematical preliminaries to the analyses and design stages of different types of algorithms.

CO2: Apply different types of data structures, analyze the best one for different types of problems and recognize the general principles and good algorithm design techniques for developing efficient computer algorithms.

CO3: Analyze on the suitability of a specific algorithm design technique for a given problem.

CO4: Implement efficient algorithms for new situations, using as building blocks the techniques learned and apply algorithm design techniques to solve problems.

Text/ Reference Books:

1 Ellis Horowitz and SartajSahni, "Fundamental of Computer algorithms", 1978, Galgotia Publ.,

2 Thomas H Cormen, Charles E Leiserson and Ronald L Rivest1, "Introduction to Algorithms", 1990, TMH.

3 Aho A.V. Hopcroft J.E, "The Design and Analysis of Computer Algorithm", 1974, Addison Wesley.

4 Berlion, P.Bizard, P., Algorithms, "The Construction, Proof and Analysis of Programs", 1986. Johan Wiley & Sons,

5 Goodman, S.E. &Hedetnieni, "Introduction to Design and Analysis of Algorithm", 1997, MGH.

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BCG-321-V
Machine Learning-1(Elective-1)
BCA-V Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the Domain of ML and basics techniques used in ML.
2 To design and apply various machine learning algorithms for supervised learning.
3 To design and apply various machine learning algorithms for unsupervised learning.
4 To understand techniques and application of ML in real world scenario.

Prerequisite: Basic understanding of linear algebra and statistics

Syllabus:

Unit I: Introduction of Machine Learning(ML)

Machine Learning basic concepts, Perspectives and Issues in Machine Learning, Types of Machine Learning, supervised – unsupervised – reinforcement, Data Representations: Numerical representation, Graph representation, Applications of Machine Learning.

Unit II: Machine Learning-Supervised Learning (Regression/Classification)

Linear models: Linear Regression, Logistic Regression, Nearest-Neighbours, Decision Trees, Support Vector Machines, Nonlinearity and Kernel Methods.

Unit III: Unsupervised Learning

K-means/Kernel K-means, Dimensionality Reduction: PCA, Matrix Factorization and Matrix Completion, Separating hyperplanes: RPL Algortihm, Optimal separating hyperplane.

Unit IV: Techniques and Applications

Scalable Machine Learning, Naïve Bayes, Introduction to Bayesian Learning and Inference, Recent trends in various learning techniques of machine learning and classification methods.

Course Outcomes:

A student will be able to:

CO1: Understood basic concepts and types of Machine Learning techniques.
CO2: Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
CO3: Understand the strength and weaknesses of various supervised and un-supervised techniques for the solving a real - world problem.
CO4: Get an insight about real life applications of ML.

Text/ Reference Books:

1 Kevin Murphy," Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2 Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning",Springer 2009 (freely available online)
3 EthemAlpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) , Third Edition, MIT Press, 2014
4 Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education.
Trevor Hastie, Robert Tibshirani, Jerome Friedman, The elements of statistical learning, springer series in statistics.

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BCG-323-V
User Interface Design (Elective I)
BCA-V Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To Understand UI Design, color scheme for different projects
2 To create Logo design principles
3 To integrate UI principle in UI design
4 To develop Mockups.

Syllabus:

Unit I: Introduction to UI Design

Introduction to Photoshop - Raster graphics - Performance Optimization - Color Calibration Workspace overview - Photoshop controls - Interface - Layers and Panels - Navigation Pan - Rotate View tool - Navigator panel - Zoom in or out - Fit an image to the screen- Photoshop Tools - Usability features - Masks in UI Design - Lights and Shadows - Emphasis and Blending.

Unit II: Color Scheme

Color Scheme - Primary Color - Secondary colors - Neutral colors - Brainstorm - Typography - Web Safe Fonts - Font Themes - Size - Color and Contrast - Tracking - Leading - Soft Buttons - 3D Buttons - Realistic Buttons - Web Template Design - Components of a Web Page.

Unit III: Logo Design Principles

Logo Design Principles - Purpose - Target audience - Planning essentials - Web Layout Design - Rule of third - Rule of odds - Poster Design Principles - F shaped pattern - Visual Hierarchy - User friendly - Photoshop Etiquette - Stretching text and images - Proofread - Make easy to find.

Unit IV: UI Illustrations

UI Illustrations - Creating visual triggers - Creative storytelling - Emotional appeal - Aesthitic satisfaction - Mobile GUI Design - Mobile GUI Guidelines - Android UI Design -

Screen Components - IOS UI Design - Animations - UI Animations in Photoshop - UI Animation in Illustrator.

Unit V: Mockup Design

Mockup Design - Responsive Web Design - Setting the stage - Basic mechanics - Typography and Layout - Navigation patterns - Advanced Enhancement -Performance - Page Designs - Metro UI Design - Mascot Design - Characters Purpose - Unique features - Exporting for Web, Mobile, Print - Design Optimization.

Course Outcomes:

A student will be able to:

CO1: Understood UI Design color scheme for different projects
CO2: Implement Logo design principles
CO3: Integrate UI principle in UI design
CO4: Acquaint mockups in different projects

Text/ Reference Books:

1 Diana MacDonald, "Practical UI Patterns for Design Systems: Fast- Track Interaction Design for a Seamless User Experience", Apress, 2019.
2 Jenifer Tidwell, "Designing Interfaces: Patterns for Effective Interaction Design" Second Edition, O'Reilly Media, Inc., 2010
3 R. Moore "UI design with Adobe Illustrator", Berkely, California: Adobe Press, 2013.
4 Lesa Snider, "Photoshop CS6: The Missing Manual", 2nd Edition, O'Reilly Media Publisher, 2012

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BCG-325-V
Digital Image Processing (Elective-I)
BCA-V Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To introduce the students with the fundamentals of digital image processing techniques.
2 To give exposure to students regarding image enhancement & filtering.
3 To give exposure to students regarding image segmentation.
4 To introduce the concept of Multi-resolution image processing tech, as well as image compression techniques and standards.

Prerequisite: Basic understanding of linear algebra.

Syllabus:

Unit I: Digital Image Fundamentals

Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels– neighborhood, adjacency, connectivity, distance measures.

Unit II: Image Enhancements and Filtering

Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters, linear and order-statistics, pixel domain sharpening filters, first and second derivative, two-dimensional DFT and its inverse, frequency domain filters, low-pass and high-pass.
Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation

Unit III: Image Segmentation

Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation

Unit IV: Image Compression

Redundancy, inter-pixel and psycho-visual, Lossless compression predictive, entropy, Lossy compression, predictive and transform coding, Discrete Cosine Transform, Still image compression standards, JPEG and JPEG-2000.

Course Outcomes:

A student will be able to:

CO1: Mathematically represent the various types of images and analyze them.
CO2: Process these images for the enhancement of certain properties or for optimized use of the resources.
CO3: Understand the purpose of Image segmentation.
CO4: Develop algorithms for image compression and coding.

Text/ Reference Books:

1 R.C. Gonzalez and R.E. Woods, “Digital Image Processing”, Second Edition, Pearson Education 3rd edition 2008.
2 Anil Kumar Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India.2nd edition 2004.
3 Murat Tekalp , “Digital Video Processing", Prentice Hall, 2nd edition 2015.

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EEU-322-V
Speech and Audio Processing
BCA-V Semester

No. of Credits:			4		
L	T	P	Total	Sessional:	25 Marks
4	0	0	4	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To familiarize the basic mechanism of speech production and the basic concepts of methods for speech analysis and parametric representation of speech.
2 To give an overall picture about the Linear Prediction and quantization of speech.
3 To impart ideas of Spectral distortion measures and Linear Prediction Coding Perception and rendering.
4 To introduce Code Excited Linear Prediction

Syllabus:

Unit I: Introduction and Speech Signal Processing
Speech production and modelling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid; Requirements of speech codecs –quality, coding delays, robustness.
Speech Signal Processing-: Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Unit II: Linear Prediction of Speech and Speech Quantization
Basic concepts of linear prediction; Linear Prediction Analysis of non-stationary signals – prediction gain, examples; Levinson-Durbin algorithm; Long-term andshort-term linear prediction models; Moving average prediction.
Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization: distortion measures, codebook design, codebook types.

Unit III: Scalar Quantization of LPC and Linear Prediction Coding

Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation; Line spectral frequency: LPC to LSF conversions, quantization based on LSF.
Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model.

Unit IV: Code Excited Linear Prediction

Code Excited Linear Prediction- CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero- input zero-state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.
Speech Coding Standards: An overview of ITU-T G.726, G.728 and G.729standards

Course Outcomes:

A student will be able to:

CO1: Understand basic concepts of speech production, speech analysis, speech coding and parametric representation of speech and apply it in practical applications
CO2: Develop systems for various applications of speech processing
CO3: Learn Scalar Quantization of Linear Prediction Coding
CO4: Aware with Code Excited Linear Prediction and Speech Coding Standards

Text/ Reference Books:

1 A. M. Kondoz, "Digital Speech", Second Edition (Wiley Students" Edition), 2004.
2 W.C. Chu, "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", Wiley Inter science, 2003.

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BCG-309-V
JAVA LAB
BCA-V Semester

No. of Credits: 1

L	T	P	T
0	0	2	2

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

2. (i) Write a Java program to develop an applet that displays a simple message.
   (ii) Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked

3. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers(Use StringTokenizer class of java.util)

4. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

5. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

6. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations.

7. Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

8. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

9. Write a Java program that displays the number of characters, lines and words in a text file.

10. Write a Java program to make frequency count of words in a given text.

BCG-311-V
Analysis of Design and Algorithms Lab
BCA-V Semester

No. of Credits: 1

L	T	P	T
0	0	2	2

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1. Write a program for Iterative and Recursive Binary Search
2. Write a program for Merge Sort
3. Write a program for Quick Sort
4. Write a program for Strassen's Matrix Multiplication
5. Write a program for Optimal Merge Patterns
6. Write a program for Huffman Coding
7. Write a program for Minimum Spanning Trees using Kruskal's algorithm
8. Write a program for Minimum Spanning Trees using Prim's algorithm
9. Write a program for Single Source Shortest Path
10. Write a program for floyd-Warshall algorithm
11. Write a program for Traveling salesman problem
12. Write a program for Hamiltonian Problem

SEMESTER VI

BCG-302-V
C# Programming
BCA-VI Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1	To Get complete knowledge of .NET Framework and its internals.
2	To Develop deep understanding of C# language features.
3	To Build strong Methods and implement the same in C# and create and manage strings, arrays, collections and enumerators using C# framework library.
4	To Understand Database Connectivity.

Syllabus:

Unit I: Introduction to .NET

The origin of .NET, Basics of .Net Framework & its Key design goals, 3-tier architecture, managed code, assemblies, CLR, IL, JIT, .NET framework class library, common type system, common language specification, Inter-operatability among managed and Unmanaged code.

Unit II: Introduction to C#

Understanding C# Environment, Basics of C#,Literals, Variables and Data Types, Operators and Expressions, Decision Making and Branching, Looping and C# Methods, Classes, Arrays, String Handling, Structures & Enumerations.

Unit III: Inheritance, Exception and Multithreading

Inheritance, Method Hiding and Overloading, Abstract Classes, Interfaces, Events and Delegates, Managing Errors & Exceptions, Creating user defined thread.

Unit IV: Database Connectivity

Architecture of ADO.Net, Comparison with ADO, ADO.Net Object Model, Net Data provider, Data Adapter, Data Set, Data Row, Data Column, Data Relation, command, Data

Reader, Connecting to Database, Accessing &Manipulating Data and Performing Data Updates.

Course Outcomes:

A student will be able to:

CO1:	Understand and apply the basic .Net, Basics of C# language.
CO2:	Apply the OOPs concepts like inheritance and polymorphism.
CO3:	Implement how Methods are created and used along with C# Arrays, Strings and Enumerated data types..
CO4:	Implement the connectivity of Database.

Text/ Reference Books:

1	E. Balagurusamy, "C# Programming", 1 July 2017
2	Mark J. Price, "C# 8.0 and .NET Core 3.0", 4th edition, Packet Publishing
3	Ian Griffiths, O'Reilly, "Programming C# 8.0", 17 January 2020
4	Mark J. Price, "C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development", 31 October 2019

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BCG-304-V
Big Data-I
BCA-VI Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1	To Understand the problem big data and the challenges involved to handle big data.
2	To Understand big data for business intelligence. Learn business case studies for big data analytics.
3	To Understand NOSQL big data management. Perform map-reduce analytics using Hadoop and related tools

Prerequisite: Prerequisite for big data is a strong foundation in data analysis and statistics

Syllabus:

Unit I: Introduction to Big Data

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data.

Unit II: Data Models

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

Unit III: Hadoop Basics

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

Unit IV: Map Reduce basics and its Types

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.

Course Outcomes:

A student will be able to:

CO1: Describe big data and use cases from selected business domains.
CO2: Explain NoSQL big data management.
CO3: Install, configure, and run Hadoop and HDFS.
CO4: Perform map-reduce analytics using Hadoop.

Text/ Reference Books:

1 Nandhini Abirami R, Seifedine Kadry, Amir H. Gandomi, Balamurugan Balusamy, "Big Data: Concepts, Technology, and Architecture", 15 June 2021

2 Vince Reynolds, "Big Data for Beginners: Understanding SMART Big Data, Data Mining and Data Analytics for Improved Business Performance Life Decisions and More!", Createspace Independent Publishing Platform, 2016

3 Raj Kamal, Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning Paperback", 16 February 2019

4 DT Editorial Services, "Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization", 1 January 2016

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BCG-306-V
Data Warehousing and Data Mining
BCA-VI Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the basic principles, concepts and Applications of data warehousing
2 To differentiate Online Transaction Processing and Online Analytical processing
3 To Describe the designing of Data Warehousing so that it can be able to solve the problems.
4 To Learn Multidimensional schemas suitable for data warehousing along with DMQL.
5 To understand various tools of Data Mining and their techniques to solve the real time problems and the task of data mining as an important phrase of knowledge discovery process.

Syllabus:

Unit I: Basics Concepts of Data Ware Housing

Need for data warehouse, definition, Database Vs data warehouse, Data Mart, Data warehouse architecture, Star, snowflake and galaxy schemas for multidimensional databases, Defining various schemas, fact and dimension data, Concept hierarchies, Metadata repository, back end tools and utilities.

Unit II: Multi-Dimensional Data Modelling

Data warehouse and OLAP technology, multidimensional data model and different OLAP operations, OLAP Servers: ROLAP, MOLAP and HOLAP, Data warehouse implementation, efficient computation of data cubes, processing of OLAP queries, indexing OLAP data.

Unit III: Data Mining

Data Pre-processing: Cleaning, data integration and transformation, data reduction; Data mining concept, task primitives, Types of Data Mining, KDD, Architecture of data mining, Data generation & Summarization based characterization, Analytical characterization,

Unit IV: Mining Association Rules in Large Databases

Mining class comparisons, Mining descriptive statistical measures in large databases, Data Mining query language, Association rule mining, Self organizing Networks..

Course Outcomes:

A student will be able to:

CO1: Design a data mart or data warehouse for any organization along with OTAP and OLAP.

CO2: Develop skills to write queries using DMQL and extract knowledge using data mining techniques.

CO3: Explore recent trends in data mining such as web mining, Apply tools and techniques of data mining in designing of new data mining techniques.

CO4: Implement data Mining is one step in the whole KDD process.

Text/ Reference Books:

1 Jiawei Han &MichelineKamber, "Data Mining - Concepts & Techniques", Harcourt India Pvt. Ltd. (Morgan Kaufmann Publishers).

2 W.H.Inmon, "Building Data Ware House", John Wiley & Sons.

3 S. Anahory and D. Murray, "Data Warehousing, Pearson Education", ASIA.

4 Michall Corey, M. Abbey, I Azramson & Ben Taub, "Oracle 8iBuilding Data Ware Housing", TMH.

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BCG-320-V
Machine Learning-II(Elective-1I)
BCA-VI Semester

No. of Credits: 3

L	T	P	Total		
3	0	0	3	Sessional:	25 Marks
				Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
2 To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3 To Explore supervised and unsupervised learning paradigms of machine learning.
4 To explore Reinforcement Learning and its techniques.

Prerequisite: Basic understanding of Machine Learning Concepts. Basic unders

Syllabus:

Unit I: Combining Different Models

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods: Boosting, Bagging, Random Forests.

Unit II: Dimensionality Reduction

Dimensionality Reduction- Linear Discriminant Analysis, Review of Principal Component Analysis, Kernel PCA, Factor Analysis – Independent Component Analysis, Recommendation System.

Unit III: Learning With Neural Networks

Artificial Neuron, Type of ANN architecture and activation functions, Perceptron, multilayer neural networks, Delta rule for learning neural network, Deep Learning - RNN, LSTM and CNN and Transfer Learning.

Unit IV: Reinforcement Learning

Reinforcement Learning overview, Elements of Reinforcement Learning, Generalization in reinforcement learning, policy search, adaptive dynamic programming, Case study for robotics design.

Course Outcomes:

A student will be able to:

CO1: Extract features that can be used for a particular machine learning approach in various IOT applications.

CO2: Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.

CO3: Mathematically analyze various machine learning approaches and paradigms.

Text/ Reference Books:

1 Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012

2 Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer 2009 (freely available online)

3 Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007

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BCG-322-V
Software Testing and Quality Assurance (Elective-1I)
BCA-VI Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1	To understand the various techniques for software testing
2	To understand the various techniques for software debugging.
3	To understand the various techniques for software maintenance.
4	To learn basics of Software Quality Models and its various standards.

Prerequisite: Fundamental understanding of software development processes (SDLC & STLC).

Syllabus:

Unit I: Basics of Software Testing

Testing terminology—error, bug/defect/fault, failure, Verification and validation, Test case design, Static testing, Dynamic testing

Unit II: Software Testing Techniques & Debugging

Black box testing Techniques, White box testing techniques, basis Validation Activities: Unit testing, Integration testing, Acceptance Testing, debugging, debugging process debugging approaches

Unit III: Software Maintenance

Software maintenance categories, Models, Introduction to Regression testing, test case prioritization and Testing Tools, Introduction to testing of object oriented software.

Unit IV: Software Quality Models and Standards

Quality concepts, Software quality assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO 9126 Standard.

Course Outcomes:

A student will be able to:

CO1: Determine the issues and challenges, formulate, review and analyze various software testing techniques.

CO2: Apply various software testing techniques to test the software at each level of software development.

CO3: Apply various software maintenance techniques to maintain the software.

CO4: Use the different quality standards for assurance of software quality.

Text/ Reference Books:

1 David Gustafson , "Software Engineering ", 2002, T.M.H

2 , Ali Behforooz and Frederick J. Hudson, "Software Engineering Fundamentals", Oxford University 1995

3 Pankaj Jalote, "An Integrated Approach to software engineering", 1991 Narosa,

4 Dr. Naresh Chauhan, "Software Testing: Principles and Practices".

5 Roger S. Pressman, "Software Engineering – A Practitioner's Approach", 1996, MGH.

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AMU-304-V
User Experience Design (Elective II)
BCA-VI Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To Understand User Experience design & User-Centered Focus in Design
2 To create Persona & Empathy Mapping
3 To integrate UX Research methodology
4 To develop Usability Testing in UX Design and Prototyping

Syllabus:

Unit I: Introduction to UX (User Experience) & User-Centered Focus in Design

What is User Experience, Dynamic Nature of UX, Differences between UX and UI, Factors that Influence User Experience, Different Roles related to UX in Industry and
What is User-Centered Design? The process of User Centered Design (UCD) and Analysis (UCA) allows us as designers to understand the user problems and provide satisfying solutions to the users. We map the user's frustrations, likes, dislikes, environment and create a fulfilling solution. UCD Process Personas Scenario Map Customer Journey Story Board Use Case.

Unit II: Persona & Empathy Mapping

In design we interact with various users to understand the user problems. Persona's helps us to define an ideal user for our solution. This fictional user is culmination of all the User Research we performed on our target User. Empathy Mapping is the next step after creating Persona. We identify what the user thinks, feels, sees or hear. This gives us an in-depth analysis of users' behavior and environment.

Unit III: UX Research Methodology

What is UX Research? Why is UX Research Important? Qualitative Data and Quantitative Data used in UX Research Types of Research Methods, Expert Review User Interview Surveys and E-mail Surveys Few more methods covered

Unit IV: Usability Testing in UX Design and Prototyping

What is Usability Testing in UX Design, How is Usability Testing carried out by UX designer?Case Study on Google Maps
As designs get finalized, we move to prototyping phase to create tap-able and clickable interactive prototypes to present to our stakeholders, customers and developers.

Course Outcomes:

A student will be able to:
CO1: Understand User Experience design
CO2: Design User-Centered Focus in Design
CO3: Implement Persona & Empathy Mapping
CO4: Integrate UX Research methodology
CO5: Acquaint Usability Testing in UX Design and Prototyping

Text/ Reference Books:

1 Don Norman, "The Design of Everyday Things", 1988
2 Leah Buley, "The User Experience Team of One: A Research and Design Survival Guide", 2013
3 100 Things Every Designer Needs to Know About People
4 Jesse James Garrett, "The Elements of User Experience: User-centered Design for the Web Book".

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OEU-238-V
High Speed Networks
BCA-VI Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To make the students familiar with High Speed Network technologies.
2 To make students aware of advantages and disadvantages of high speed
3 technologies. Study of techniques available for congestion control traffic management.
4 To study integrated and differentiated services architecture.
5 Protocols for high speed communication

Syllabus:

Unit I: High Speed Networks

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel, Wireless LANs: Applications, requirements, Architecture of 802.11

Unit II: Congestion and Traffic Management

Queuing Analysis, Queuing Models, Single Server Queues, Effects of Congestion, Congestion Control, Traffic management, Congestion Control in Packet Switching Networks, Frame Relay Congestion Control.

Unit III: TCP and ATM Congestion Control TCP

Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO backoff, KARN's Algorithm, Window management, Performance of TCP over ATM. Traffic and Congestion control in ATM, Requirements, Attributes, Traffic Management Frame work, Traffic Control, ABR traffic Management, ABR rate control, RM cell formats.

Unit IV: Integrated and Differentiated Services

Integrated Services Architecture, Approach, Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services

Course Outcomes:

A student will be able to:

CO1: Understand basic high speed networks like Frame relay and ATM.
CO2: Familiar with advantages and disadvantages of high speed network.
CO3: Aware of congestion control traffic management techniques.
CO4: Aware of TCP and ATM congestion control techniques

Text/ Reference Books:

1 William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Educatin, Second Edition, 2002.

2 Warland&PravinVaraiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.

3 IrvanPepelnjk, Jim Guichard and Jeff Apcar, "MLS and VPN architecture", Cisco Press, Volume1 and 2, 2003.

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BCG-310-V
C# Lab
BCA-VI Semester

No. of Credits: 1

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments:

1. Accept a character from console and check the case of the character.
2. Write a program to accept any character from keyboard and display whether it is vowel or not.
3. Write a program to implement a calculator with memory and recall operations.
4. Write a c# program to print fibonacci series without using recursion and using recursion.
5. Write a program to checkArmstrong number.
6. Write a c# program to check palindrome number.
7. Write a program to Swap two numbers without using third variable.
8. Write a program to Reverse a Number.
9. Write a c# program to convert number in characters.
10. Develop a form in C# to pick a date from Calendar control and display the day, month, and year details in separate text boxes.
11. Develop a C# application to perform timer based quiz of 10 questions.
12. Develop a database application to store the details of students using ADO.NET
13. Develop a database application using ADO.NET to insert, modify, update and delete operations.

BCG-312-V
Big Data-I Lab
BCA-VI Semester

No. of Credits: 1

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments:

1. Installation of Hadoop.

2. To perform HDFS Shell basic operations.

3.. Write a program to cut, copy and paste the file or directory from HDFS to the local file system.

4. Write a program to get status of a file in the HDFS.

5. Write a program that using Hadoop APIs to do the "ls" operation for listing all files in HDFS.

6. Implementation of MapReducer as follows (Running the WordCount program): -

7. Modify the given example: WordCount

9.
   - Main function – add an argument to allow user to assign the number of Reducers.
   - Mapper – Change WordCount to CharacterCount (except " ")
   - Reducer – Output those characters that occur>= 20 times

10. After finishing part I, SORT the output of part I according to the number of times using the mapreduce programming model.

11. Java Programming examples on Stack, Queue and Linked List

12. Implementation of wrapper classes in java

13. Implementation of Java objects using the concept of serialization.

BCG-314-V
Data Warehousing & Data Mining Lab
BCA-VI Semester

No. of Credits: 1

L	T	P	T		
0	**0**	**2**	**2**	**Sessional:**	**15 Marks**
				Theory:	**35 Marks**
				Total: 50 Marks	
				Duration of Exam:	**3 Hours**

List of Experiments:

1. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets.
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc
4. Implementation of Text Mining on the data warehouse
5. Evaluate Information Gain of an attribute in the student database
6. Experiment to predict the class using the Bayesian classification
7. Demonstrate performing classification on data sets
8. Find out a weight & bias updating using the Back Propagation Neural Network
9. Demonstrate performing Regression on data sets
10. Experiment on k-means Data Clustering algorithms on weather data set.
11. Experiment on hierarchal Data Clustering algorithms on weather data set.
12. To perform various data mining algorithms on the give data base using WEKA

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SEMESTER VII

BCG-401-V
Research Methodology
BCA - VII Semester

No. of Credits: 3

L	T	P	Total		
3	0	0	3	Sessional:	
				Theory:	
				Total:	
				Duration of Exam:	

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 Understand the research process in order to plan a research proposal.
2 Learn methods to devise and design a research set-up.
3 Plan and perform data collection methods.
4 Learn tools, techniques for data analysis and conclude research in report writing and dissertation

Syllabus:

Unit I: Introduction to Research

Definition, need and purpose of research, types of research, research process, approaches to research, planning a research proposal, literature review. Indexes vs. Scales, Types of Scale, construction of Scale, Bogardus social distance scale, Thurstone Scale, Likert Scale, Semantic Differential Scale, Guttmann Scale.

Unit II: Data Collection Methods

Experiments and surveys, experiments: classical experiments, independent & dependent variables, pre-testing &post-testing, double-blind experiment, subject selection, a variation on experiment design. survey research: topics appropriate for survey research, guidelines for asking questions, questionnaire construction, strengths & weaknesses of survey research,

Unit III: Sampling Techniques

Non-probability sampling, probability sampling, theory & logic of probability sampling, sampling distributions & estimates of sampling error.

Unit IV: Data Analysis mad Report Writing

Qualitative v/s quantitative data analysis, qualitative data analysis: discovering patterns, grounded theory method, semiotics, conversation analysis, qualitative data processing. quantitative data analysis: quantification of data, univariate analysis, bivariate analysis, multivariate analysis, regression analysis, and description analysis. hypothesis. multiple attribute decision-making,

Report preparation, structure of report, report writing skills, citations, research papers, intellectual property rights, plagiarism, patent, commercialization, ethical issues.

Course Outcomes:

A student will be able to:

CO1: Understood the planning of the research proposal.
CO2: Learnt about system architecture, framework and processes.
CO3: Learnt data sampling distribution methods and apply in research.
CO4: Perform qualitative,, quantitative data analysis and writing a research report with proper citations.

Text/ Reference Books:

1 R. Panneerselvam, "Research Methodology", 2nd Ed.PHI
2 C.R. Kothari & Gaurav Garg, "Research Methodology", 3 rd Ed. New Age Publishers
3 C. George Thomas, "Research Methodology and Scientific Writing", Ane Books
4 Earl Babbie, "The Practice of social research", 14th Ed. Cengage
5 Gwo-Hshiung Tzeng and Jih-Jeng Huang, "Multiple Attribute Decision Making", CRC Press

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BCG-403-V
BIG DATA II
BCA - VII Semester

No. of Credits:			3	
L	T	P	Total	Sessional:
3	0	0	3	Theory:
				Total:
				Duration of Exam:

Course objectives:
1. To learn and understand about I/O in Hadoop.
2. To understand about programming tools PIG and Hive
3. To learn and understand modelling data in PIG and HIVE in Hadoop ecosystem
4. To learn about Spark Ecosystem

SYLLABUS

UNIT – I Hadoop I/O

The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT – II Pig

Introduction, Pig Architecture, Pig Latin Data model, Pig Latin operators, Pig Diagnostic operators, Pig Data manipulation, built-in functions, user defined functions, Scripting with Pig Latin.

UNIT – III Hive

Getting Started with Apache Hive, Hive architecture, working with Hive Data Types, Creating and Managing Databases and Tables, views and indexes, Hive Data Manipulation Language, Querying and Analyzing Data.

UNIT – IV Spark

Introduction, Spark Architecture, Advantages over traditional data approaches, Spark Ecosystem, Spark for Big Data processing and its applications.

Course outcomes:

The student will be able to
CO1: Develop programs for Hadoop I/O
CO2: Implement solutions in PIG & HIVE ecosystem.
CO3: Create data modelling techniques to large data sets
CO4: Understand Spark ecosystem.

Text Books/Reference Books

1. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly
2. Alex Holmes, “Hadoop in Practice”, MANNING Publ.
3. Seema Acharya, and Subhashini Chellappan, “Big Data and Analytics”, (2015). Wiley Publication.
4. DT Editorial Services, “Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization”, 2016

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BCG-405-V
Cloud Computing
BCA - VII Semester

Discipline- Specific Major

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the concept of cloud computing, related databases and file systems.
2 To learn cloud middleware, Mobile Computing, Grid Computing and Sky Computing.
3 To learn the fundamentals of cloud security, its tool and cloud computing security architecture and understand the challenges involved in cloud computing security.
4 To analyze issues involved in cloud computing while implementing real-time Applications over the cloud and discuss the issues regarding intercloud environments, QOS,
5 To discuss research issues to be explored regarding load balancing, resource optimization, and dynamic resource provisioning in cloud computing.

Syllabus:

Unit I: Introduction to Cloud Computing

Definition, characteristics, components, cloud provider, saas, paas, iaas and others. organizational scenarios of clouds, administering & monitoring cloud services, benefits and limitations. cloud computing platforms: infrastructure as service: amazon, ec2 platform as service: google app engine, Microsoft azure, utility computing, elastic computing

Unit II: Using Cloud Technologies

Study of hypervisors compare SOAP and REST web services, AJAX and mashups-web services, SOAP versusRest, AJAX: asynchronous 'rich' interfaces, mashups: user interface services. multitenant software: multi-entity support, multi-schema approach, multitenancy using cloud data stores, data access control for enterprise applications.

Unit III: Creating and Storing Cloud Data

Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, Features and comparisons among GFS, HDFS.

Unit IV: Security and Quality Issues for Cloud Data

Privacy and security in cloud, cloud computing security architecture: - general issues, trusted cloud computing, micro-architecture, identity management and access control, autonomic security. cloud computing security challenges: virtualization security management- virtual threats, vM security recommendations and techniques. issues in intercloud environments: qos issues and monitoring in cloud, dependability, data migration, streaming in cloud. cloud middleware, load balancing, resource optimization, resource dynamic reconfiguration, and monitoring in cloud.

Course Outcomes:

A student will be able to:

CO1: Manage cloud data in relational databases and file systems.
CO2: Acquaint knowledge about cloud technologies, web services and software involved in cloud computing to design enterprise applications.
CO3: Implement various security measures on cloud data.
CO4: Deployment of Applications over cloud computing platform.

Text/ Reference Books:

1 Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper , "Cloud Computing", Wiley India Edition
2 Gautam Shroff, "Enterprise Cloud Computing", Cambridge
3 Ronald Krutz and Russell Dean Vines, "Cloud Security", Wiley-India
4 Tim Malhar, S.Kumaraswammy, S.Latif, "Cloud Security & Privacy", (SPD,O'REILLY)
5 Antohy T Velte, et.al , "Cloud Computing: A Practical Approach", McGraw Hill,

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BCG-407-V
Information Security and Cyber Law
BCA - VII Semester

Discipline- Specific Major
No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand information security, its related terms like threat, attack, control etc.
2 To introduce various security challenges in different application domains
3 To learn E- Transactions issues and security measures and resolution.
4 To learn network attack, security, Cyber law and IPR.

Syllabus:

Unit I: Basics of Information System and Security

History of information systems and its importance, basics, changing nature of information systems, need of distributed information systems, role of internet and web services, information system threats and attacks, classification of threats and assessing damages security in mobile and wireless computing security challenges in mobile devices, authentication service security, security implication for organizations, laptops security basic principles of information security, confidentiality, integrity availability and other terms in information security, information classification and their roles.

Unit II: Security Threats in E- Transactions

Security threats to e-commerce, virtual organization, business transactions on the web, e-governance, concepts in electronic payment systems, e-cash, credit/debit cards. physical security-needs, disaster and controls, basic tenets of physical security and physical entry controls, access control- biometrics, factors in biometrics systems, benefits, criteria for selection of biometrics, design issues in biometric systems, interoperability issues, economic and social aspects, legal challenges

Unit IV: Models of Cryptographic Systems mad Network Security

Model of cryptographic systems, issues in document security, system of keys, public key cryptography, digital signature, the requirement of the digital signature system, fingerprints, firewalls, design and implementation issues, policies. ,Basic concepts, dimensions, perimeter for network protection, network attacks, the need of intrusion monitoring and detection, intrusion

detection virtual private networks- need, use of tunnelling with VPN, authentication mechanisms, types of VPNs and their usage, security concerns in VPN.

Unit V: Cyber Law

Classification and their benefits information security & law, IPR, patent law, copyright law, legal issues in data mining security, building security into software life cycle ethics- ethical issues, issues in data and software privacy cybercrime types & overview of cyber crimes

Course Outcomes:

A student will be able to:

CO1: Acquaint about information security, its related terms like threat, attack, control etc.
CO2: Learnt various security challenges in different application domains
CO3: Learn E- Transactions issues and security measures and resolution.
CO4: Acquaint about network attack, security, Cyber law and IPR.

Text/ Reference Books:

1 Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill
2 Sood,"Cyber Laws Simplified", Mc Graw HillFurnell, "Computer Insecurity", Springer
3 Merkov, Breithaupt, "Information Security", Pearson Education
4 Yadav, "Foundations of Information Technology", New Age, Delhi
5 IT ACT 2008 "https://police.py.gov.in/Information Technology Act 2000/2008 (amendment).pdf"

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BCG-421-V
Elective III
Computer Vision
BCA-VII Semester

Discipline Specific Major

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the basics of image formation and computer vision.
2 Learn image manipulation using Python libraries.
3 Use Python and Deep Learning to build image classifiers
4 To learn the concept of transfer learning.

Syllabus:

Unit I: Introduction to Computer Vision

Introduction, Overview and State-of-the-art, The Four Rs of Computer Vision, Geometry of Image Formation, Digital Image Formation and low-level processing, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Restoration, Histogram Processing, Two View Geometry, Planar Scenes and Homography, Interest Point Detection.

Unit II: Image Basics with Computer Vision

Features of Image, Read, write & show Image, Read, write & show Image using Webcam, Draw Geometric shapes, Mouse Event handling, Arithmetic operation on Image, Bitwise operations on Image, image augmentation and pre-processing.

Unit III: Image Manipulation

Translation of Image, Rotation of Image, Scaling of Image, Image Wrapping, Blurring and Smoothening of Image, Sharpening of Image, Image Enhancement, Image Morphing, Image Cloning, Image Segmentation, Image Registration.

Unit IV: Computer Image Methods

Simple Thresholding, Adaptive Thresholding, Erosion & Dilation, Edge Detection, Image Pyramids, Image Blending, Contours, Sorting of Contours, Matching of Contours, Motion: Optic Flow, Normalized Cross-Correlation

Unit V: Recognition and Classification

Instance recognition, Image classification, Object detection, Semantic segmentation, Image classification, transfer learning, and fine-tuning the pre-trained CNN.

Course Outcomes:

A student will be able to:

CO1: Acquaint knowledge about image formation and computer vision.
CO2: Learn image manipulation using Python libraries.
CO3: Use Python and Deep Learning to build image classifiers
CO4: Understand the concept of transfer learning.

Text/ Reference Books:

1 Richard Szeliski , "Computer Vision: Algorithms and Applications"..
2 David Forsyth and Jean Ponce, "Computer Vision: A Modern Approach", (Second Edition)
3 Robert Tibshirani, and Jerome Friedman, "Elements of Statistical Learning by Trevor Hastie".
4 Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", UM Library.

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BCG-423-V
Elective III
Agile Methodologies and JIRA
BCA - VII Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 Interpret the concept of agile software engineering and its advantages in software development
2 To learn Agile planning and estimation.
3 To create an Agile Software Project using Scrum methodology and Analyze the core practices behind several specific agile methodologies.
4 To integrate and understand Agile testing in Agile Software Project

Syllabus:

Unit I: Introduction to Agile

Key motivations for iterative development, meeting the requirements and challenges iteratively, Risk driven & client-driven iterative planning, time-box iterative development, Evolutionary & adaptive development, Evolutionary requirement analysis, incremental & evolutionary delivery.
Agile manifesto, Agile principles, Agile Methods-Extreme Programming, Scrum Development methodology, Crystal family of methodologies, Rational Unified Process (RUP).

Unit II: Agile Planning, Prioritization and Estimation

Agile planning, velocity, prioritizing story & themes, Kano model for prioritization, Estimation, estimating size with story points, estimating with ideal days & ideal time, ideal day as a measure of time, techniques for estimating, re-estimation, choosing between story points & ideal days, splitting user-stories, estimating user-stories, release plan, updating the release plan.

Unit III: Agile Software Development using Scrum

Adaptive scrum, Product backlog, Sprint, Scrum life cycle, Scrum estimation, Scrum Planning, Working with scrum. Scrum Burn-down

Unit IV: Agile Testing and JIRA

Introduction to Agile testing quadrants, test-driven development, unit testing, component testing, functional testing, story testing, exploratory testing, scenario testing, usability testing, acceptance testing, performance and load testing, security testing, ility testing, pair testing, Agile software management using JIRA

Course Outcomes:

A student will be able to:

CO1: Understand software engineering and Agile principles involved in building large software programs and process of requirements specification and requirements validation.
CO2: Apply estimation techniques, schedule project activities and compute pricing.
CO3: Access implications of Agile methodology: Scrum.
CO4: Integrate Agile testing in agile software development.
CO5: Acquaint and apply agile practices and plan for agility for agile software development and make use of various tools available to agile teams to facilitate the project.

Text/ Reference Books:

1 Mike Cohn, "Mike Cohn S/w development using Scrum, Succeeding with Agile"
2 Craig Larman, "Agile & iterative development", A Manager's Guide
3 ,Lisa Crispin, Janet Gregory, "Agile Testing, A Practical Guide for Testers and Agile Teams"

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BCG-425-V
Elective III
Virtual Reality and Augmented Reality
BCA (DS) - VII Semester

Discipline Specific Major

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand VR/AR systems work and list the applications of vr
2 To learn the design and implementation of the hardware that enables VR/ AR systems to be built.
3 To create the system of human vision and its implication on perception and rendering.
4 To integrate concepts of motion and tracking I VR/AR systems.

Syllabus:

Unit I: Introduction to VR

Defining virtual reality, history of VR, human physiology and perception, key elements of virtual reality experience, virtual reality system, interface to the virtual world-input & output- visual , aural & haptic displays, applications of virtual reality.

Unit II: Introduction to AR

Defining augmented reality, the history of augmented reality, the relationship between Augmented Reality and Other technologies-media, technologies, other ideas related to the spectrum between real and virtual worlds, applications of augmented reality, concepts related to augmented reality, ingredients of an augmented reality, and experience.

Unit III: Virtual Representation

Representation of the virtual world, visual representation in VR, aural representation in VR and haptic representation in VR, geometric models, axis-angle representations of rotation, viewing Transformations, chaining the transformations, Human Eye, eye movements & implications for VR.

Unit IV: Visual Rendering

Visual perception-perception of depth, perception of motion, perception of colour, combining sources of information, visual rendering ray-tracing and shading models, rasterization, correcting optical distortions, improving latency and frame rates

Course Outcomes:

A student will be able to:

CO1: Understood VR/AR systems work and list the applications of VR.
CO2: Design and implement the hardware enabling VR/AR systems to be built.
CO3: Implement and understand the system of human vision and its implication on perception and rendering.
CO4: Integrate concepts of motion and tracking in VR/AR systems.

Text/ Reference Books:

1 Steven M. Lavalle, "Virtual Reality", CambridgeUniversityPress,2016

2 William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design", (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA,2002

3 Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design" , Morgan Kaufmann,2009.

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BCG-409-V
Embedded Systems
BCA - VII Semester

Discipline- Specific Minor

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To learn design concepts and approaches of embedded systems using advanced controllers.
2 To learn hardware design features and memories of embedded systems
3 To learn software design features of embedded systems
4 To learn microprocessor related memories.

Syllabus:

Unit I: Introduction to Embedded Systems

Introduction to Embedded Systems Design: Embedded system overview, design challenges, processor technology, design technology, and Examples of Embedded System.

Unit II: Custom Single-purpose Processor

Hardware, Basic combinational logic design, Sequential logic design, custom single purpose processor design

Unit III: General Purpose Processor

Software, Basic architecture, operation, programmer's view, development environment, ASIC processors.

Unit IV: Microprocessor Memories

Memory writes ability and storage permanence, common memory types, memory hierarchy and cache, Advanced RAM. And Purpose processors, peripherals, Timers, counters, watchdog timers, UART, PWM, RTC, LCD controllers, keypad controllers, ADCs, Stepper motor controllers, Microprocessor Interfacing: Communication basics, I/O addressing, Interrupts, DMA, arbitration

Course Outcomes:

A student will be able to:

CO1: Understand the design concept and approach of embedded systems using advanced controllers.
CO2: Apply hardware design features and memories of embedded systems.
CO3: Develop software design features of embedded systems.
CO4: Develop Microprocessor related memories.
CO5: Implement processor peripherals and their interfacing with microprocessors

Text/ Reference Books:

1 Frank Vahid, “Embedded System Design” Wiley India Edition, 2001.
2 J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole
3 Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
4 David Simon, "An Embedded Software Primer", Addison Wesley, 2000
5 K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996

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BCG-411-V
BIG DATA –II LAB
BCA VII Semester

List of Programs:

I) Working with Pig using various built-in and user-defined functions.

1. Installation of Cloud era to work with Pig.
2. Execute various commands and queries.
3. Loading data
4. Produce histogram.
5. Sum the word counts for each word length using the SUM function with the FOREACH GENERATE command.
6. Copy the data file into HDFS.
7. Importing CSV files, creating tables in pig.
8. Facebook analysis by installing plug-into see the details like: liked pages of friends etc. and many other activities.

II) Working with Hive

1. Installation of Hive
2. Introduction to Hive shell
3. Making a script file in Hive.
4. Loading dataset, loading tables.
5. Creating tables, creating databases, editing tables.
6. Apply various queries like:
7. Different ways of querying through Interactive shell window or using Hive script.

III) Introduction to Spark framework and Spark installation

1. Understand the purpose of Spark Context.
2. Initialize Spark with the various Programming Languages.
3. Passing functions to Spark and run some Spark Examples

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BCG-431-V
Lab Based on Elective III
Computer Vision Lab
BCA - VII Semester

Discipline Specific Major

No. of Credits: 01

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1 Python for IP and CV
   i. Python for image processing
   ii. Contrast Sketching
   iii. Linear Filtering

2 Skin Color Detection using Python
3 Wrapping and Estimations
4 Local Structures using Python
5 Image Stitching using SIFT
6 Image Classification using transfer learning
7 Object detection using transfer learning

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BCG-433-V
Lab Based on Elective III
Agile Methodologies and JIRA Lab
BCA-VII Semester

Discipline- Specific Minor

No. of Credits: 1

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1 Management of Agile Projects with powerful Agile Boards
   i) Scrum
   ii) Kanban

2 Track the progress of the Project in the timeline view to give the visibility
3 Creating Dashboards in JIRA
4 View Repositories and Deployment Status in JIRA
5 Automate Workflow in JIRA
6 Issue and Bug Tracking of Project in JIRA

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BCG-435-V
Lab Based on Elective III
Virtual Reality and Augmented Reality Lab
BCA-VII Semester

Discipline Specific Major

No. of Credits: 1

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1 Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.

2 Demonstration of the working of HTC Vive, Google Cardboard, Google Day dream and Samsung gear VR. Demonstration of the working of Oculus Quest devices.

3 Develop a scene in Unity that includes:
   i. a cube, plane and sphere, apply transformationsonthe3gameobjects.
   ii. add a video and audio source.

4 Develop a scene in Unity that includes a cube, plane and sphere. Create a new material and texture separately for three Game objects. Change the colour, material and texture of each Game object separately in the scene. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically on Button clicks.

5 Develop a scene in Unity that include sa sphere and plane. Apply rigid body component, material and Box collider to the game Objects. Write a C# program to Grab and throw the sphere using VR controller.

6 Develop a simple UI(User interface) menu with images,canvas sprites and button.

7 Create an immersive environment (living room/ battlefield/ tennis court) with onlystaticgameobjects.3DgameobjectscanbecreatedusingBlenderoruseavailable 3D models.

8 Include animation and interaction in the immersive environment created in Assignment.

9 Marker-based Tracking, Marker less Tracking (SLAM), Environmental Understanding and Spatial Mapping, Object Recognition and Tracking.

10 User Interaction in AR, Designing and Implementing AR User Interfaces, 3D Modeling and Asset Creation for AR, Animation and Effects in AR, Project Development and Iteration

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