BCA – 3rd Semester

Sr. No.	Course Category	Course Code	Course Title	Teaching Load			Credits	Examination Marks			
				L	T	P		Internal	Theory	Practical	Total
1.	Core	BCA-301	Database Management System	3	-	-	3.0	40	60	-	100
2.	Core	BCA-302	Web Designing Fundamentals	3	-	-	3.0	40	60	-	100
3.	Core	BCA-303	Computer System Architecture	3	1	-	4.0	40	60	-	100
4.	Interdisciplinary	BCA-304	Mathematical Foundation	3	1	-	4.0	40	60	-	100
5.	Core	BCA-305	Data Communication & Networking	4	-	-	4.0	40	60	-	100
6.	Core	BCA-306	DBMS Lab.	-	-	2	1.0	60	-	40	100
7.	Core	BCA-307	Web Designing Lab.	-	-	2	1.0	60	-	40	100
8.	Specialization	BCA-308	Project-I	–	-	2	1.0	60	-	40	100
8.	Activity	NSS-001/ NCC-001	NSS/ NCC	-	-	2	1.0	100	-	-	100
9.			**Total**	**16**	**2**	**8**	**22.0**	**480**	**300**	**120**	**900**

Note: Student can replace two subjects in a semester from the MOOC courses (SWAYAM) with the same credits and course category of the replaced subject.

BCA – 301 Database Management System

Continuous evaluation: 40	**L T P**	**Credits: 3.0**
End semester exam: 60	**3 - -**	**Maximum Time: 3 Hrs.**
Total marks: 100		

Course Objective: The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve information. Students will be able to understand and apply logical database design principles, including E-R diagrams and database normalization.

Course Outcome: On completion of the course, students will be able to

1. Understand the basic concepts and the applications of database systems.
2. Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.
3. Learn the basics of SQL and construct queries using SQL.
4. Understand the relational database design principles.
5. Apply and relate the concept of transaction, concurrency control and recovery in database.

Unit - I (10 Lectures)

Basic Concepts: Introduction of Data base management system, Need of DBMS, Characteristics of data modeling and Database, Data storage and retrieval, Concurrency control, Data integrity and security, Database languages, Data vs. Information, Database, Conventional File Processing Vs DBMS, Data Models, Schema & Instances, Subschema.

Data Abstractions & Data Independence: Introduction of 3-Tier Architecture, Three Schema Architecture of DBMS: Physical level, Conceptual level, External level, Physical and logical Data independence, Database administrator, Database users.

Unit - II (12 Lectures)

The Entity-Relationship Model: Entity, Entity Set, notations used for ER Diagram, Design issues, Attributes and Keys, Strong and Weak Entity Sets, Entity-relationship diagram, Minimization of ER diagram, Recursive Relationships, Impedance Mismatch, Generalization, Specialization and Aggregation.

Relational Model: Structure of Relational Database, Keys in Relational Model: Candidate, Super, Primary, Alternate and Foreign**,** Mapping from ER model to Relational model, Integrity Constraints, Functional Dependencies.

Normalization: Full and partial, Normalization: Different anomalies in designing a database, 1NF, 2NF, 3NF & BCNF, 4NF, 5NF.

Unit - III (10 Lectures)

Relational Algebra: Introduction, Basic operators, Extended operators, Inner join vs. Outer join, Join Operation vs. Nested Query, Tuple Relational Calculus.

SQL: Introduction, Types of SQL Commands, Writing Queries in SQL, aggregate functions, Nested Queries, Null values and Embedded SQL, Dynamic SQL.

Unit - IV

(12 Lectures)

Transaction Management: Transaction Concept and State, Steps for ATM Transactions, ACID properties, Overview of serializability, Serializable and non-serializable transactions.
Concurrency Control: Introduction to Concurrency, Concurrency problems: Dirty read, Incorrect summary, Lost update, Concurrency control techniques, Timestamp-based Protocols and Deadlock Handling.
Database recovery: Database Recovery Technique, Backward recovery, Forward recovery, Log based recovery.

Instructions for Paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C comprises of 4 questions of 4 marks each, one from each unit. Section D comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however each question in section C and D shall have two alternatives, out of which student will be required to attempt one question.

Text Books:

1. Korth & Silberschatz, Database System Concepts, TMH, 5th ed., 2006.
2. Elmasri & Navathe, Fundamentals of Database System, A. Wesley, 5th ed., 2013.

Reference Books:

1. Date C. J, An Introduction to Database Systems, Narosa Publishing, 8th ed., 2009.
2. S. K Singh, Data Base Systems: Concept Design and Applications, Pearson, 2nd ed., 2011.
3. Thomas Connolly, Carolyn Begg, Database Systems, A Practical Approach to Design, Implementation & Management, Pearson, 6th ed., 2019.

BCA – 302 Web Designing Fundamentals

Continuous evaluation: 40	**L T P**	**Credits: 3.0**
End semester exam: 60	**3 - -**	**Maximum Time: 3 Hrs.**
Total marks: 100		

Course Objective: The aim of this course is to provide the knowledge of fundamental principles of web design. This course is designed to gain an understanding of web technologies and architectures.

Course Outcome: On completion of the course, students will be able to

1. Learn and understand the terminology related to Web Designing
2. Understand how web applications work.
3. Learn how to create websites and complete UI designs.
4. Learn to write valid and concise code for webpages.
5. Learn to develop a dynamic website with database connectivity.
6. Understand, analyze and build interactive web applications.

Unit - I (10 Lectures)

Fundamentals of Web designing: Basics of Internet, World Wide Web, Web page, Web Browser, Web Server, Proxy Server, Static and Dynamic web page, Website Development: Website overview, Website types, Website designing, Development, Publishing, Hosting, Website URL registration.
Client Side Scripting Languages: Java Script, Active X control and Plug-ins, Web Server Architecture, Image maps, CGI, API web database connectivity: DBC, ODBC.

Unit - II (10 Lectures)

HTML5: Introduction, Basic Tags, Elements, Attributes, Formatting, Phase tags, Meta tags, Images, Tables, List, Text links, Text Styles, Text Effects, Image links, Frames, I frames, Blocks, Background, Colors, Fonts, Embed multimedia, Marquees.
HTML Forms: Form Tag, Attributes of Form, Form Elements, Input Type, Input Attributes, POST and GET Method, Creating a Live Website Form, HTML Validators.

Unit - III (12 Lectures)

CSS: Introduction, Syntax, Inclusion, Measurement Units, Colors, Backgrounds, Fonts, Text, Images, Links, Tables, Borders, Margins, List, Padding, Cursors, Outlines, Dimensions, Scrollbars
CSS Advanced: CSS visibility, Positioning, Layers, Pseudo Classes, Pseudo Elements, Text effects, Media Types, Printing, Layout, Validations, CSS Id and Class, Box Model, 2D Transform, 3D Transform, Animation, Box Sizing.
Responsive Web Design with Bootstrap: Introduction to Bootstrap, Installation of Bootstrap, Grid System.

Unit - IV (12 Lectures)

JavaScript: Introduction to JavaScript, JavaScript Types, Literals, Variables, Data Types, Operators in Conditions Statements, Loops, Switch, Functions JS Popup Boxes, Events, Arrays, Working with Arrays, Objects, Functions, String, Validation of Forms.
Document Object Model: Introduction to DOM, DOM Method, DOM Document, CSS, Animation, DOM Events, Event Listener.
JS Browser Object Model: JS Window, Screen, Location, History, Navigator, Pop up alert, Cookies.

Instructions for Paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C comprises of 4 questions of 4 marks each, one from each unit. Section D comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however each question in section C and D shall have two alternatives, out of which student will be required to attempt one question.

Text Books:

1. Honey Cutt, Using the Internet, PHI, 4th ed., 1998.
2. Kogent Learning Solutions Inc., HTML 5 in Simple Steps, Dreamtech Press, 2012.
3. Thomas A. Powell, The Complete Reference: HTML & XHTML, TMH, 4th ed., 2006.
4. Douglas E. Comer, Computer Networks and Internets, Addison Wisley, 4th ed., 2009.

Reference Books:

1. Xavier, World Wide Web Design with HTML, TMH, 2006.
2. Achyut S Godbole & Atul Kahate, Web Technologies, Tata McGraw-Hill, 2nd ed., 2012.
3. Brian K Williams & Stacey C. Sawyer, Using Information Technology, TMH, 6th ed, 2008.
4. Ryan Benedetti, Had first jQuery, O'Reily Publishers, 1st ed., 2011.

BCA-303 Computer System Architecture

Continuous evaluation: 40	**L T P**	**Credits: 4.0**
End semester exam: 60	**3 1 -**	**Maximum Time: 3 Hrs.**
Total marks: 100		

Course Objective: The aim of the course is to understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of computers and identify the elements of modern instructions sets and their impact on processor design.

Course Outcome: On completion of the course, students will be able to

1. Understand the architecture and functionality of central processing unit.
2. Demonstrate concepts related to processors, memories and I/Os.
3. Explain the function of each element of a memory hierarchy.
4. Identify and compare different methods for computer I/O
5. Analyze the performance of commercially available computers.

Unit - I (11 lectures)

Introduction: Basics of Computer Architecture, Functional units Organization, Arithmetic Logical unit, Central processing unit.

Basic computer Organization: Computer registers, Types of Registers, General Register Organization, Computer instructions, Instruction Cycles, Memory reference instruction, Input / Output instructions.

Register Transfer Logic: Register transfer Language, Register Transfer, Bus & memory transfer, Common bus system, Micro-operations: Arithmetic, Logic and Shift micro-operations, Arithmetic logic Shift Unit.

Unit - II (13 lectures)

Central Processing Unit: CPU Block Diagram, Stack organization, Instruction format, Types of Instruction Format, Addressing Modes.

Data Transfer and Manipulation Instructions: Data transfer & manipulation Instructions: Arithmetic, Logical & bit manipulation, shift instruction, Program control, Branch Instruction and handling, RISC& CISC.

Interrupt: Program Interrupts, Types of Interrupt, Interrupt Structure and Interrupt cycle.

Unit - III (11 lectures)

Control Unit: Introduction to control unit and its functions, Hardwired vs. Micro programmed control unit.

Input/output organization: Peripheral devices, I/O Bus, I/O Asynchronous Data Transfer: Strobe Control and Handshaking, Data Transfer Schemes: Programmed I/O, Interrupt Driven I/O, I/O Processor, DMA Controller, Transfer of Information between CPU/Memory and I/O.

Unit - IV (12 lectures)

Introduction to Parallel Processing: Pipelining, Instruction Level Parallelism (ILP), Super scale Processor, Characteristics of multiprocessors.

Memory Unit: Memory hierarchy, Processor vs. memory speed, High-speed memories, Cache memory, Cache Coherence, Associative memory, Virtual memory, Memory management hardware.

Instructions for Paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C comprises of 4 questions of 4 marks each, one from each unit. Section D comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however each question in section C and D shall have two alternatives, out of which student will be required to attempt one question.

Text Books:

1. Moris Mano, Computer System Architecture, PHI Publications, 3rd ed., 1992.
2. John L. Hennessy, Computer Architecture, MK Publication, 5th ed., 2012.
3. B. Govindarajalu, Computer Architecture & Organization, McGraw Hill, 2nd ed., 2017.

Reference Books:

1. W. Stallings, Computer Organization & Architecture: Designing for Performance, Pearson Education.
2. J. P. Hayes, Computer Architecture & Organization, McGraw Hill.
3. S. Tannenbaum, Structured Computer Organization, PHI.

BCA - 304 Mathematical Foundation

Continuous evaluation: 40	**L T P**	**Credits: 4.0**
End semester exam: 60	**3 1 -**	**Maximum Time: 3 Hrs.**
Total marks: 100		

Course Objective: The course will help students to develop conceptual understanding and acquire the knowledge for solving problems of matrices, basics of differential calculus, integral calculus and statistics which explains the different problems in mathematical foundation

Course Outcome: On completion of the course, students will be able to

1. Learn the basic concepts of matrices, algebra and Calculus.
2. Solve mathematical based computer problems.
3. Learn the basic concepts of integration.
4. Familiar with Measures of Central Tendency and Measures of Dispersion Range.
5. Develop analytical ability in the students to solve real-world problems using these methodologies.

Unit - I (10 Lectures)

Determinants & Matrices: Determinant and its properties, Definition of matrix, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Rank of Matrix, Dependence of Vectors, Cayley Hamilton Theorem.

Unit - II (12 Lectures)

Vector Algebra: Definition of a vector in 2 and 3 Dimensions, Double and Triple Scalar and Vector Product and their Applications.

Limits & Continuity: Limit at a Point, Properties of Limit, Continuity at a Point, Continuity over an Interval.

Differentiation: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation.

Unit - III (10 Lectures)

Successive Differentiation Rolle's Theorem, Mean Value Theorem.

Integration: Indefinite Integrals, Methods of Integration by Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcendental Functions.

Unit - IV (10 Lectures)

Statistics: Measures of Central Tendency, Preparing Frequency distribution table, Arithmetic mean, Geometric mean, Harmonic mean, median and mode. Measure of dispersion: Range, mean, deviation, standard deviation, co-efficient of variation.

Instructions for Paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C comprises of 4 questions of 4 marks each, one from each unit. Section D comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however each

question in section C and D shall have two alternatives, out of which student will be required to attempt one question.

Text Books:

1. B.S. Grewal, Elementary Engineering Mathematics, 34th ed., 1998.
2. Dr. Deepak Gupta, A Text Books of Engineering Mathematics, Part I &II, 3rd ed., 2012.

Reference Books:

1. S. P. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2013.
2. S. P. Gupta and V.K. Kapoor, Fundamentals of Applied statistics, Sultan Chand & Sons, 4th ed., 2014.
3. H.K. Dass, Advanced Engineering Mathematics, S. Chand & Company, 9th ed., 2009.
4. Shanti Narayan, Integral Calculus, S. Chand & Company, 2009.
5. Shanti Narayan, Differential Calculus, S. Chand & Company, 2009.

BCA-305 Data Communication & Networking

Continuous evaluation: 40	**L T P**	**Credits: 4.0**
End semester exam: 60	**4 - -**	**Maximum Time: 3 Hrs.**
Total marks: 100		

Course Objective: This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. This course illustrate how computer network hardware and software operate, Investigate the fundamental issues driving network design and Learn about dominant network technologies.

Course Outcome: On completion of the course, students will be able to

1. Understand the basic concepts of data communication, protocols and interworking between computer networks and switching components.
2. Enumerate the layers of the OSI model and TCP/IP.
3. Understand and build the skills of routing mechanisms.
4. Familiarize with the basic protocols and how they can be used to assist in network design.

Unit - I (12 Lectures)

Data Communication Concepts: Components of a data communication system, Network Topologies, Structures of Networks, Network Architecture: Concept of protocols & services, OSI model and functions of its layers, TCP/IP reference model, Transmission modes, Transmission media: guided and unguided media, Routers, Bridge, Amplifier, MUX.

Unit - II (10 Lectures)

Framing and Error Control: Framing techniques, Error control-error detection & correction: Hamming Method, CRC and checksum, Data Link Control: Acknowledgments, Medium Access Control and LANs, Multiple Access protocols of MAC sub layer, ALOHA: pure and slotted, 1-persistent, p-persistent and non-persistent CSMA, CSMA/CD and Collision free protocols.

Unit - III (12 Lectures)

Switching: Circuit Switching, Message switching and packet switching, Addressing: Physical and Logical.

Routing: Deterministic and Adaptive routing, Centralized and distributed routing, Shortest-path, Flooding, Flow based, Optimal, Distance vector, Link-state, Hierarchical, Routing for mobile hosts, Broadcast and multicast routing.

Unit - IV (10 Lectures)

Congestion Control: Principles of Congestion Control, Traffic shaping, Choke Packets, Load Shedding.
Multiplexing: Frequency Division multiplexing and Time division multiplexing, Modulation and Demodulation, MODEM.

Instructions for Paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C comprises of 4 questions of 4 marks each, one from each unit. Section

D comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however each question in section C and D shall have two alternatives, out of which student will be required to attempt one question.

Text Books:

1. Behrouz Forouzan, Data communications and Networking, Tata Mc-Graw Hill, 5th ed., 2013.
2. Andrew S. Tanenbaum, Computer Networks, Pearson Education.
3. Godbole Achyut S., Atul Kahate, Data Communications and Networks, Tata Mc-Graw Hill.

Reference Books:

1. William Stallings, Data and Computer Communications, Pearson education, 8th ed., 2007.
2. Fred Halsall, Data Communications, Computer Networks and Open Systems, Pearson Education.