Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A $^{+}$' Grade

CIRCULAR NO.SU/ Sci./College/NEP-2020/73/2025

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/ Ad-hoc Boards/Committee and recommended by the Dean, Faculty of Science & Technology, the Academic Council at its meeting held on 09 May 2025 has been accepted **the following B.Sc. Course Structure & Curriculum** under the Faculty of Science & Technology as per National Education Policy – 2020 run at the Affiliated Colleges of Dr. Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	B.Sc. Physics	IIIrd and IVth Semester
2	B.Sc. Electronics	IIIrd and IVth Semester
3	B.Sc. Mathematics	IIIrd and IVth Semester
4	B.Sc. Industrial Chemistry	IIIrd and IVth Semester
5	B.Sc. Agrochemical and Fertilize	IIIrd and IVth Semester
6	B.Sc. Horticulture	IIIrd and IVth Semester
7	B.Sc. Biochemistry	IIIrd and IVth Semester
8	B.Sc. Botany	IIIrd and IVth Semester
9	B.Sc. Zoology	IIIrd and IVth Semester
10	B.Sc. Biotechnology	IIIrd and IVth Semester
11	B.Sc. Microbiology	IIIrd and IVth Semester
12	B.Sc. Diary Science and Tecihnology	IIIrd and IVth Semester
13	B.Sc. Statistics	IIIrd and IVth Semester
14	B.Sc. Computer Science	IIIrd and IVth Semester
15	B.Sc. Geology	IIIrd and IVth Semester
16	B.Sc. Chemistry	IIIrd and IVth Semester
17	B.Sc. Analytical Chemistry	IIIrd and IVth Semester
18	B.Sc. Polymer Chemistry	IIIrd and IVth Semester
19	B.Sc. Environmental Science	IIIrd and IVth Semester
20.	B.Sc. Fisheries Science	IIIrd and IVth Semester

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21.	B.Sc. Home Science	IIIrd and IVth Semester
22.	B.Sc. Data Science	IIIrd and IVth Semester
23.	B.Sc. Information Technology	IIIrd and IVth Semester
24.	B.Sc. Networking and Multimedia	IIIrd and IVth Semester
25.	B.Sc. Automobile Technology	IIIrd and IVth Semester
26.	B.Sc. Forensic Science	IIIrd and IVth Semester
27.	B.Sc. Forensic Science & Cyber Security	IIIrd and IVth Semester
28.	B.Sc. Non-Conventional & Conventional Energy	IIIrd and IVth Semester
29.	B.Sc. Clinical Laboratory Science	IIIrd and IVth Semester
30.	Bachelor of Computer Application	IIIrd and IVth Semester

This is effective from the Academic Year 2025-26 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
Ref.No. SU/Sci./2025/827-29
Date:- 26/05/2025

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Deputy Registrar,
Syllabus Section.

Copy forwarded and necessary action to :-

1] **The Principal of all Affiliated Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

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Dr. Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar- 431001

B.C.A. (Science) Degree Programme

(Three Year / Four Years (Hons) /Four Years (Hons with Research)

Course Structure and Syllabus

(AS PER NEP-2020)

Subject : B.C.A. (Science)

Second Year Third and Fourth Semester

3 / 4 Year Degree Course

Effective from 2025-26

18/06/2025

PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Computer Application (B. C. A.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Computer Application (B. C. A.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands- on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Computer Application (B. C. A.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Computer Application (B. C. A.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Computer Application (B. C. A.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

Programme Educational Objectives (PEOs) :

These Programme Educational Objectives delineate the core principles guiding the Bachelor of Computer Applications curriculum, underscoring our commitment to nurturing graduates equipped to excel in their careers, contribute meaningfully to society, and lead purposeful lives amidst the rapid evolution of technology.

1. **Mastery of Discipline-Specific Knowledge**: Graduates of the Bachelor of Computer Applications program will demonstrate a profound comprehension of fundamental principles, theories, and methodologies in computer application development and related fields. This expertise will empower them to dissect intricate computational problems, devise innovative solutions, and contribute to advancements in the realm of computer applications.

2. **Interdisciplinary Proficiency**: Graduates will possess the adeptness to synthesize knowledge and skills from various domains within computer science, fostering a holistic approach to problem-solving and innovation. They will be equipped to tackle multifaceted challenges by integrating diverse perspectives and methodologies, ensuring comprehensive solutions in the ever-evolving landscape of technology.

3. **Critical Thinking and Analytical Skills**: Graduates will cultivate robust critical thinking abilities, enabling them to scrutinize information rigorously, analyze data effectively, and make well-founded decisions grounded in evidence. Proficiency in logical reasoning and scientific methodologies will empower them to address complex computational problems and spearhead novel solutions.

4. **Leadership and Innovation**: Graduates will exhibit leadership qualities and an entrepreneurial mindset essential for catalyzing positive change in technological spheres. They will showcase creativity, resilience, and adaptability, leveraging innovation to confront intricate challenges and capitalize on opportunities for advancement within the dynamic landscape of computer applications.

Global Citizenship and Cultural Sensitivity: Graduates will embrace a global perspective and cultural sensitivity, acknowledging the interconnectedness of diverse communities in the digital age. They will actively engage in cross-cultural dialogue, embrace diversity, and contribute to the enrichment of knowledge and understanding on a global scale, fostering collaboration and cooperation across borders.

Programme Outcomes (POs) :

These outcomes are designed to equip graduates with the technical expertise, analytical acumen, ethical sensibilities, and lifelong learning capabilities necessary to thrive in the dynamic landscape of computer application.

1. **PO 1 – Disciplinary knowledge:**

Graduates will adeptly apply mathematical principles, algorithmic paradigms, and core computing fundamentals in the modeling, design, and development of computer-based systems, leveraging advanced technologies to address contemporary challenges.

2. **PO 2 – Scientific reasoning/ Problem analysis:**

Graduates will demonstrate advanced analytical skills to systematically analyze, categorize, and formulate solutions for multifaceted problems encountered within the domain of computer applications, utilizing cutting-edge technologies to enhance problem-solving capabilities.

3. **PO 3 – Problem solving:**

Graduates will engineer software solutions to address complex scientific, business, and societal challenges, integrating considerations for modern technologies while prioritizing public health, safety, and environmental sustainability.

4. **PO 4 – Environment and sustainability:**

Graduates will comprehend the environmental and societal impact of software solutions, striving to develop sustainable applications that promote societal well-being within the context of modern technological advancements.

5. **PO 5 – Modern tool usage:**

Graduates will proficiently utilize contemporary software development tools and methodologies to facilitate efficient and collaborative development practices, incorporating emerging technologies seamlessly into their workflows.

6. **PO 6 – Ethics:**

Graduates will navigate ethical complexities inherent in computer application development, upholding professional integrity and social responsibility within the dynamic landscape of technology integration.

7. **PO 7 – Cooperation / Teamwork:**

Graduates will collaborate effectively as integral members or leaders of interdisciplinary teams, leveraging diverse skill sets and perspectives to achieve collective objectives in software development projects.

8. **PO 8 – Communication Skills:**

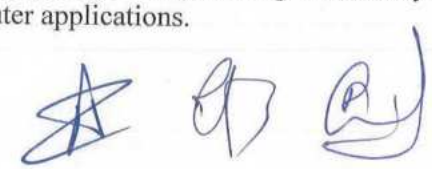
Graduates will demonstrate proficiency in communicating technical concepts and insights to diverse audiences, adeptly preparing and presenting technical documentation tailored to the needs of stakeholders in computer application projects.

9. **PO 9 – Self-directed and Life-long Learning:**

Graduates will exhibit a proactive commitment to continuous self-improvement and professional development, recognizing the imperative of lifelong learning to remain abreast of evolving technologies and industry trends.

10. **PO 10 – Enhance the research culture and uphold scientific integrity and objectivity:**

Graduates will actively contribute to fostering a vibrant research culture, upholding the principles of scientific integrity, objectivity, and reproducibility in their scholarly pursuits within the diverse realms of computer applications.



Programme Specific Outcomes (PSOs):

1. **PSO1. Software Application Development Excellence**: Apply programming paradigms and software engineering principles, practices, and tools to analyze, design, implement, test, and maintain software systems that meet quality standards and user requirements.
2. **PSO2. Web Application Development Mastery**: Design and develop dynamic and interactive web applications using modern web technologies and frameworks, ensuring compatibility, performance, and security across different platforms and devices.
3. **PSO3. Data-driven Decision Making:** Utilize data analysis techniques, statistical models, and visualization tools to analyze, interpret, and present data effectively for decision-making and problem-solving in diverse domains.
4. **PSO4. Cybersecurity Implementation:** Implement security measures, conduct risk assessments, and respond to security incidents to protect information assets and mitigate cyber threats effectively, ensuring data confidentiality, integrity, and availability.
5. **PSO5. Cloud Computing Integration:** Design, deploy, and manage scalable and cost-effective cloud-based solutions using cloud computing technologies and platforms, ensuring reliability, availability, and performance to meet business needs and enable digital innovation.
6. **PSO6. User Experience Innovation:** Design and evaluate user interfaces and interactive systems using human-centered design approaches to create engaging, accessible, and usable experiences that meet user needs and preferences.

Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

Subject: B.C.A. (Science)

B.C.A. (Science) Second Year: 3rd Semester

Course Type	Course Code	Examination Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
				Theory	Practical	Theory	Practical	
Major (Core) Mandatory DSC	BCA/DSC/T/ 200		Core Java	2		2		2+2+2+2 = 08
	BCA/DSC/T/ 201		Database Management System	2		2		
	BCA/DSC/P/ 226		Practical based on BCA/DSC/T/200		4		2	
	BCA/DSC/P/ 227		Practical based on BCA/DSC/T/201		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	BCA/Mn/T/ 200		To be chosen for other discipline of same faculty	2		2		2+2 = 04
	BCA/Mn/T/ 201			2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	BCA/GE/OE/ T/200		To be chosen from other faculty	2		2		02
VSC (Vocational Skill Courses) (Choose any one from BCA/VSC/T/ 200 and BCA/VSC/T/ 201) and corresponding Practicals	BCA/VSC/T/ 200		PC Maintenance-II	1		1		1+1 =02
	BCA/VSC/T/ 201		Web Fundamentals	1		1		
	BCA/VSC/P/ 226		Practicals based on BCA/VSC/T/ 200		2		1	
	BCA/VSC/P/ 227		Practicals based on BCA/VSC/T/ 201		2		1	
AEC, VEC, IKS	BCA/AEC/T/ 200		**English** (Common for all the faculty)	2		2		2 + 2 = 04
	BCA/VEC/T/ 201		Environmental Studies	2		2		
OJT/ FP/CEP/CC/RP	BCA/CC/P/ 226		Cultural Activity / NSS,NCC (Common for all the faculty)		4		2	02
				15	**14**	**15**	**07**	**22**

Minor courses for other discipline

BCA/Mn/T/ 200 – Computational Mathematics

BCA/Mn/T/ 201 - Computer System Architecture

Generic /Open Elective Courses for other faculty

BCA/GE/OE/T/200 Cyber Ethics and Cyber Law

B.C.A. (Science) Second Year: 4th Semester

Course Type	Course Code	Examination Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
				Theory	Practical	Theory	Practical	
Major (Core) Mandatory DSC	BCA/DSC/T/ 250		Advanced Java	2		2		2+2+2+2 = 08
	BCA/DSC/T/ 251		PHP Programming-I	2		2		
	BCA/DSC/P/ 276		Practical based on BCA/DSC/T/250		4		2	
	BCA/DSC/P/ 277		Practical based on BCA/DSC/T/ 251		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	BCA/Mn/T/250		To be chosen for other discipline of same faculty	2		2		2+2 = 04
	BCA/Mn/T/ 251			2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	BCA/GE/OE/ T/250		To be chosen from other faculty	2		2		02
SEC (Skill Enhancement Courses) (Choose any one from BCA/SEC/T/250and BCA/SEC/T/ 251) and corresponding Practicals	BCA/SEC/T/250		Python-I	1		1		1+1 =02
	BCA/SEC/T/ 251		Web Designing	1		1		
	BCA/SEC/P/ 276		Practicals based on BCA/SEC/T/250		2		1	
	BCA/SEC/P/ 277		Practicals based on BCA/SEC/T/ 251		2		1	
AEC, VEC, IKS	BCA/AEC/T/ 250		Modern Indian Language (MIL-2) (Choose any one from pool of language courses)	2		2		02
OJT/ FP/CEP/CC/RP	BCA/FP/P/ 276		Field Project		4		2	2+2= 04
	BCA/CC/P/ 277		(Fine/ Applied/ Visual/ Performing Arts) (Common for all the faculty)		4		2	
				13	**18**	**13**	**09**	**22**
Exit Option : Award of UG Diploma in major and minor with 88 credits and an additional 4 credits NSQF course (related to major / minor) / Internship during summer vacation OR Continue with Major and Minor								

Minor courses for other discipline

BCA/Mn/T/ 250 - Numerical Computation Methods

BCA/Mn/T/ 251 - Software Project Management

Generic /Open Elective Courses for other faculty

BCA/GE/OE/T/250- Fundamental of Computer Network

B. C. A. (Science)
Semester - III

BCA/DSC/T/200: Core Java

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.To understand the basic concepts and fundamentals of platform independent object oriented language.

2.To demonstrate skills in writing programs using exception handling techniques and multithreading.

3.To understand streams and efficient user interface design techniques.

Course Outcomes (COs) :

1.Use the syntax and semantics of java programming language and basic concepts of OOP.

2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.

3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

4. Design event driven GUI and web related applications which mimic the real word scenarios.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction**: Introduction to java, java features, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals. **Classes and Objects:** Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, constructors **Inheritance:** Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.	**10 Hrs**
II	**Interfaces:** Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces variables in interface and extending interfaces. Packages: Creating a Package, setting classpath, Access control protection, importing packages. **Exception Handling**: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. **Strings:** Exploring the String class, String buffer class, Command-line arguments. Library: Date class, Wrapper classes	**10 Hrs**
III	**Applets**: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events. **AWT:** AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.	**10 Hrs**

Text Books

1.Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education (India) Private Limited, New Delhi.

Reference Books:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Introduction to Java programming, By Y.DaniclLiang,Pearson Publication.

BCA/DSC/P/ 226: Practical based on BCA/DSC/T/200 (Core Java)	
Total Credits : 02 Maximum Marks : 50	Hours : 60 Hrs
Sample List of experiments to be carried out based on the course BCA/DSC/T/200	
1	Introduction to java environment, javac, jdb and javadoc
2	Program in java to Defining simple class and creating objects
3	Program in java to Creating an array of objects.
4	Program in java to implement inheritance in java.
5	Program in java to define abstract classes.
6	Program in java to define and use interfaces and Functional Interface
7	Program in java to demonstrate Exception Handling Mechanism in Java.
8	Program in java to demonstrate use of try, catch, throw, throws ,finally blocks
9	Program in java to Creation of files and demonstration of I/O operations
10	Program in java to Defining User defined Exception classes
11	Program in java to demonstrate GUI creation using Swing Package and Layout managers.
12	Program in java to understand Event handling mechanism in Java

BCA/DSC/T/201: Database Management System

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

i) To understand the fundamental concepts of database
ii) To understand user requirements and frame it in data model.
iii) To understand creations, manipulation and querying of data in databases.

Course Outcomes (COs) :

After completion of the course, students will be able to -

i) Design data models, schemas and instances
ii) Design E-R Model for given requirements and convert the same into database tables.

Implement SQL: Data definition, constraints, schema, queries and operations inSQL

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction, Levels of abstraction & data independence, Structure of DBMS, Users of DBMS, Advantages of DBMS, design process, Introduction to data models: E-R model, Relational model, Network model, Hierarchical model Constraints : Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint, Domain, Check constraint	10 Hrs
II	Overview of Database: Extended features – Specialization, Aggregation, Generalization, Introduction to query languages, Basic structure, DDL Commands, DML Commands, Forms of a basic SQL query (Expression and strings in SQL) Set operations, Aggregate Operators and functions, Date and String functions, Null values, Nested Sub queries SQL mechanisms for joining relations (inner joins, outer joins and their types), Views	10 Hrs
III	Introduction to Relational-Database Design, undesirable properties of an RDBdesign, Functional Dependency, Lossless join, Lossy join, Dependency Preservation Normalization, Normal Forms-1NF,2NF ,3NF and BCNF	10 Hrs

Reference Book

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill, 6th Edition, 2010
2. Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill, 3rd Edition, 2003
3. Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2004.

BCA/DSC/P/ 227: Practical based on BCA/DSC/T/201 (Database Management System)	
Total Credits : 02 Maximum Marks : 50	Hours : 60 Hrs
Sample List of experiments to be carried out based on the course BCA/DSC/T/201	
1.	To create simple tables with only the primary key constraint (as a tablelevel constraint & as a field level constraint) (include all data types).
2.	To create more than one table make referential integrity using foreign key and primary key constraint.
3.	To create one or more tables with following constraints, in addition to the first two constraints (PK & FK) Check constraint Unique constraint Not null constraint
4.	To drop a table, alter schema of a table on table already created in previous Assignments.
5.	insert / update / delete records using tables (use simple forms of insert / update / delete statements)
6.	To query the tables using simple form of select statement Select <field- list> from table [where <condition> order by <field list>] Select <field-list, aggregate functions > from table [where <condition> group by <> having <> order by <>]
7.	To query tables using nested queries
8.	Sort the records using order by command(ascending and descending order)
9.	To write a queries using aggregate functions (MAX, MIN, SUM, COUNT, MOD, AVG)
10.	To create views.

BCA/Mn/T/ 200: Computational Mathematics

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Prerequisites:

Basic understanding of mathematical concepts (School or Junior College).

Learning Objectives

To expose the students to the following:

- Set theory concepts like Finite Set, Subset, Empty Set and operations on set.
- Matrices and its various types.
- Various concepts in graphs like its representation and its types.

Learning Outcomes

After successful completion of course the student should be able to

- Know how to represent various statements using set, relations, functions, permutations and combinations, groups, graphs and
- Use logical notations to formulate and reason about fundamental mathematical concepts such as sets.
- Model and solve real world problems using graphs.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Set Theory:** Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set.	**10 Hrs**
II	**Introduction to Matrices:** Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix. **Combination:** Review of Permutation and Combination, Mathematical Induction - Pigeon hole principle, Principle of Inclusion and Exclusion	**10 Hrs**
III	**Basics of Graph Theory and Tree:** Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Union and Intersection Operation.	**10 Hrs**

Text Books

1. Elements of Discrete MathematiCA-A Computer Oriented Approach C. L Liu, D.P. Mohapatra, 3rd edition Tata McGraw Hill.
2. Discrete Mathematical Structures with Applications to Computer Science,J. P.Tremblay and P. Manohar,Tata McGraw Hill
3. Foundations of Computer Science, A. Aho and J. Ullman- W. H. Freeman, 1992.

Reference Books

1. 1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.

2. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.

BCA/Mn/T/ 201: Computer System Architecture

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.Develop a strong foundation in number systems and Boolean algebra.
2.Understand the working principles of logic gates and combinational circuits.
3.Understand arithmetic logic circuits such as adders, subtractors, multiplexers.
4.Learn about flip-flops, counters, and shift registers and their role in sequential circuits.
5.Understand the internal architecture of the 8086 microprocessor.
6.Explore different addressing modes and memory management techniques.

Learning Outcomes

1. Convert between binary, decimal, octal, and hexadecimal number systems.
2. Apply Boolean algebra to simplify and design logic circuits.
3. Analyze combinational circuits (adders, multiplexers).
4. Explain the architecture and pin functions of 8086 microprocessor.
5. Implement different addressing modes and execute ALP programs.
6. Perform arithmetic, logical, and data manipulation operations in assembly language.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Digital Electronics Basics** **Number system:** Binary Number System, Octal number system, Decimal Number System & Hexadecimal number system, Decimal to Binary conversion, Binary to Decimal Conversion, Hexadecimal to binary, Binary to Hexadecimal, 1's complement, 2'scomplement **Logic gates:** AND, OR, NOT, Ex-OR, NAND, NOR gates as a universal building blocks. Logic diagram, Boolean expression and truth tables of each gates. **Flip-flops:** Introduction of Flip Flops, RS Flip Flop, JK Flip flops, D Flip Flop, T Flip Flop	**10 Hrs**
II	**Counters** Asynchronous Counter & Synchronous counter, MOD-12 counter. **Introduction to Microprocessor and Microcomputer:** Historical background, Microprocessor based personal computer system, Computer data formats, Microcomputer structure and operation	**10 Hrs**
III	**8086 Hardware specification:** 8086 internal architecture, Pin out and Pin Connections **Addressing Modes:** Data addressing modes, Program memory addressing modes, Stack memory addressing modes	**10 Hrs**

Text Books

1. Digital Electronics and Micro-Computers-R.K.Gaur, Dhanpat Rai Publication.
2. The Intel Microprocessors: Architecture, programming and interfacing- By Barry B. Brey.

Reference Books

1. Digital Electronics and Logic Design-N.G.Palan, Technova Publication
2. Microprocessors and Interfacing: Douglas Hall

BCA/GE/OE/T/200: Cyber Ethics and Cyber Law

Total Credits : 02 Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

1. Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
2. Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
3. Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
4. Understand Criminal Liability, Cyber Crime implications and challenges.
5. Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime

Learning Outcomes

1.Understand Cyber Space, Cyber Crime, InformationTechnology, Internet & Services.
2. List and discuss variousforms of Cyber Crimes
3. Explain Computer and Cyber Crimes
4. Understand Cyber Crime at Global and Indian Perspective.
5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Cyber Law Evolution of computer technology, emergence of cyber space, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	10 Hrs
II	Information Technology Act Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.	10 Hrs
III	The Importance of Cyber Law, Significance of Cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.	10 Hrs

Text Books

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, Dominant Publisher
2. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3. Godbole,"Information Systems Security", Willey

Reference Books

1. Reich, Pauline C, "Law, Policy, and Technology: Cyberterrorism, Information Warfare, and Internet Immobilization", IGI Global, 2012.
2.Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York.

BCA/VSC/T/200: PC Maintenance-II

Total Credits : 01 Hours : 15 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

i) Learn working of PC and SMPS
ii) Learn various ports and their connections
iii) Understand Motherboard BIOS setting and network setting
iv) Installation of operating systems and its setting
v) Understand working and settings of CCTV & Projector

Course Outcomes (COs) :

After completion of the course, students will be able to -

i) Assemble a PC and able solve basic trouble shooting
ii) Connecting various peripheral devices and installation of their drivers
iii) Perform BIOS setting and IP setting
iv) Install different Operating systems like Window, Linux.
v) Perform CCTV Settings and taking backup, connecting Projector to PC/Laptop and its setting.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Understanding and Working with Personal Computers :** Understanding How PCs Work. The Four Main Functions of Computing. PC Hardware Components. How PCs Work. Working with PCs. PC Workspaces and Tools, Preventive Maintenance, Environmental and Safety Concerns. SMPS: Types and its working trouble shooting	**05 Hrs**
II	**Motherboard** Motherboards & Central Processing Units, Identifying Motherboards, Types of Motherboards, Motherboard Form Factors, Mother Board Components : Central Processing Unit (CPU), Processor Sockets and various Slots, Motherboard Buses, Chipsets, Expansion Slots, Memory Slots, Connectors, BIOS Setup, CMOS Battery, Jumpers and DIP Switches, Firmware, Cache Memory Study of Peripheral Devices, Connecting these Devices to system Installation of Device Driver and Configuration of various Devices Types of RAMS (DDR2, DDR4,...) and hard drives, Graphics Cards: Introduction, working and types.	**05 Hrs**
III	**Operating System Settings:** Operating System Installation (Windows, Linux), Creating Users, types of Users. IP setting for network shearing and Internet access in Windows and Linux. Antivirus types, installation, Configuration, updating, PC cleaning. **CCTV:** Types of cameras, Cables used in CCTV, Configuration and installation of cameras, DVR and its Settings, taking backup of recording. **Projector:** Types of Projectors, Installation, Configuration, settings.	**05 Hrs**

Reference Book

1. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
2. Wiley Pathways PC Hardware Essentials Project Manual by Groth, David ;Gilster, Ron, Liberty Lake, Washington ; Polo, Russel

BCA/VSC/P/ 226: Practical based on BCA/VSC/T/ 200 (PC Maintenance-II)	
Total Credits : 01 Maximum Marks : 50	Hours : 30 Hrs
Sample List of experiments to be carried out based on the course BCA/VSC/T/ 200	
1	Laboratory Tools and equipment handling Techniques.
2	Assembling and disassembling a PC
3	PC Cleaning.
4	SMPS Testing and troubleshooting
5	Types of cables used in PC connection internal and external, data cables, power supply, VGA, HDMI, etc.
6	Mother board parts and their connection fitting a motherboard changing CMOS battery, RAM, HDD, CD/DVD drive, adding a HDD.
7	Basic BIOS settings.
8	Installation of Windows operating system (Windows7 – Windows10).
9	Creating users and assigning rights to users, sharing folders and devices in a network, IP settings.
10	Installing device drivers (automatic and manual).
11	CCTV installation and DVR settings with app management.
12	Projector installation and settings.
13	Preventive maintenance of PC (Disk Cleanup, disk defragmentation, check disk & fixing errors)

BCA/VSC/T/201: Web Fundamentals

Total Credits : 01 Hours : 15 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

i) Understanding basics of web browsers and its types.

ii) Comprehend the foundational structure of HTML documents, encompassing elements, tags, attributes, and their interconnections.

iii) Understand the basics concept and principles of web technologies.

iv) Understand basics of Java script and validations using Java Script

Course Outcomes (COs) :

After completion of the course, students will be able to -

i) Understand fundamentals of web technologies.

ii) Construct visually appealing static web page.

iii) Understand linking in web page.

iv) Understand basics of forms.

v) Basic validations using Java script

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to HTML**: Overview of HTML, definition, HTML document object model (HTML DOM), Learn HTML Using Notepad. Introduction HTML elements and attributes. **HTML headings and paragraphs:** Basics of HTML heading, understanding use of <h1> to <h6>tags , introduction to <p> tag. Attributes of each tag. **HTML text formatting and quotation tags:** HTML <b>, <i>, <u>, , , <sub>, <sup>, <mark>, <del>, tags. Understanding the use of blockquote>,<q>, <abbr>, <address>, <cite>, and <bdo> tags.	**5 Hrs**
II	**HTML images and links:** use of images, image file formats: jpg, png, bmp, and use of image tags, and its attributes. Introduction to anchor tag and its attributes. Introduction to <link> tag and its attributes. **Introduction to HTML list tags, Frame tag, tables and forms:** ordered list, unordered list, definition list, introduction to <table> tags, <th>, <tr>, and <td> tags and its attributes. Introduction to form tag and its attributes, GET and POST methods, <input> tag and its attributes. Introduction to <button> tag.	**5 Hrs**
III	Introduction to JavaScript: Overview of JavaScript, definition, features of JavaScript, Applications of JavaScript. JavaScript <script> tag JavaScript Variables and datatypes: what is variables, global variables, Primitive data type and non-primitive (reference) data types Operators in JavaScript JavaScript control statement: if , if else, if else if, switch Introduction to Loops: for loop, while loop, do-while loop, for-in loop.	**5 Hrs**

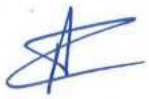
Text Book

1. Beginning HTML, XHTML, CSS, and JavaScript by Jon Duckett, Wiley Publishing, Inc.
2. WEB TECHNOLOGIES 2010 by Uttam K.
3. A Smarter Way to Learn JavaScript by Mark Myers

Reference Book

1. A Smarter Way to Learn JavaScript by Mark Myers
2. JavaScript: The Definitive Guide by David Flanagan

BCA/VSC/P/ 227: Practical based on BCA/VSC/T/201 (Web Fundamentals)	
Total Credits : 01 Maximum Marks : 50	Hours : 30 Hrs
Sample List of experiments to be carried out based on the course BCA/VSC/T/201	
1	Write a HTML program to demonstrate the use of Heading tags.
2	Write a HTML program to demonstrate the use of text formatting tags.
3	Write a HTML program to demonstrate use of list tags and its attributes.
4	Write a HTML program to demonstrate use of anchor tag.
5	Write a HTML program to demonstrate the use of table tags and its attributes.
6	Write a HTML program to demonstrate the use of form tags and its attributes.
7	Write a HTML program to take design an input from.
8	Write a HTML program to demonstrate use of frame tag and its attributes
9	Creating a JavaScript-enabled page, Using the JavaScript alert() method and prompt() method, Using the JavaScript document.write() method
10	Write a program for storing user data in a JavaScript variable
11	Write a program for assigning and adding variables in JavaScript
12	Write a program to demonstrate use of if, if else, if else if in Java Script
13	Write a program to demonstrate use of switch statement in Java Script
14	Write a program to demonstrate use of for loop in Java Script
15	Write a program to demonstrate use of while loop, do-while loop in Java Script



B. C. A. (Science)
Semester - IV

BCA/DSC/T/250: Advanced Java

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.To understand the basic concepts and fundamentals of platform independent object oriented language.

2. To demonstrate skills in writing programs using exception handling techniques and multithreading.

3.To understand streams and efficient user interface design techniques.

Course Outcomes (COs) :

1.Use the syntax and semantics of java programming language and basic concepts of OOP.

2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.

3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

4. Design event driven GUI and web related applications which mimic the real word scenarios.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Multithreading:** Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks. I/O Streams: Streams, Byte streams, Character streams, File class, File streams. **Introduction To Swing**, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons	**10 Hrs**
II	**Java database Programming**, java.sql Package, JDBC driver, Built-in exceptions, creating own exception sub classes. **Network Programming** With java.net Package, Client and Server Programs, Content And Protocol Handlers RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization	**10 Hrs**
III	**J2EE architecture**, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers **Server side programming with Java Servlet**, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application **JSP architecture**, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension .	**10 Hrs**

Text Books

1.Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education (India) Private Limited, New Delhi.

Reference Books:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Introduction to Java programming, By Y.DanielLiang,Pearson Publication.

BCA/DSC/P/ 226: Practical based on BCA/DSC/T/250(Advanced Java)	
Total Credits : 02 Maximum Marks : 50	Hours : 60 Hrs
Sample List of experiments to be carried out based on the course BCA/DSC/T/250	
1	Write a Program in Java to implement Calculator using Swing technology
2	Write a Program that displays two textboxes for entering a students' Roll-no and Name with appropriate labels and buttons.
3	Write a Java program that makes a connection with database using JDBC and prints metadata of this connection
4	Include the database connectivity in the program no.1.2 to insert, update, delete and display of student information.
5	Write a java program for one way TCP communication for server and client, where server will response to client with current data and time.
6	Write a java program for two way TCP communication for server and client. It should look like a simple chat application
7	Write a java program for UDP Communication where client will send name of country and server will return the capital of that country.
8	Create a simple calculator application that demonstrates the use of RMI. You are not required to create GUI.
9	Create Servlet That Prints Hello World.
10	Create Servlet for login page, if the username and password is correct then prints message "Hello username" else a message"login failed".
11	Create Servlet that uses cookies to store the number of times a user has visited the servlet.
12	Create a Servlet filter that calculates server's response time and add it to response when giving it back to client.
13	Create a jsp that prints hello world.
14	Create a jsp that add and subtract two numbers.
15	Create a custom JSP tag that prints current date and time. Use this tag into JSP page

BCA/DSC/T/251: PHP Programming

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

To install and configure MySQL

- To install and configure Apache with PHP
- To create MySQL users and grant privileges
- To test PHP and MySQL installations
- To configure PHP

Course Outcomes (COs) :

After completion of this course, the learners will be able to:-

- Analyze the construction of a web page and relate how PHP and HTML combine to produce the web page.
- Compare and contrast PHP variable types, and relate the advantages and disadvantages of PHP variables with local or global scope.
- Formulate, design and create PHP control structures, including selection and iterative structures.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to PHP: What is PHP? Why PHP? Evolution of PHP. Installation: PHP on windows and Linux, Configuring: Apache & PHP, Running & Testing PHP Script, Combining PHP with HTML. PHP Language Basics: Building blocks of PHP: Variables, Data Types, Operators and Expressions and Constant. Decision within PHP: if, if.. else, if.. elseif .. else, switch, Ternary Operator Looping within PHP: *while, do...while, for, Break* & *Continue* statement	**10 Hrs**
II	Functions in PHP: What is function, why functions, Calling function, Returning Value from function, Recursive function. Arrays in PHP: What & Why Array Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. Objects in PHP: What is Class & Object, Creating a Class & Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor.	**10 Hrs**
III	String in PHP: Creating and Accessing String, formatting String, Searching String, Manipulating String. Date and Time: Understanding TimeStamp, Getting Date and time, Extracting values of date-time, Formatting date-time. Understanding file & directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading	**10 Hrs**

Reference Books:

1) **Beginning PHP 5.3** , Author: Matt Doyle, Wiley Publishing, Inc.
2) **SAMS Teach yourself PHP in 24 hours,** Author: Matt Zandstra, Sams Publishing.
3) **"PHP, MySQL and Apache All in One"** , Author: Juliea C. Meloni, SAMS series

BCA/DSC/P/277: Practical based on BCA/DSC/T/251(PHP Programming-I)	
Total Credits : 02 Maximum Marks : 50	Hours : 60 Hrs
Sample List of experiments to be carried out based on the course BCA/DSC/T/251	
1.	Write a PHP script to demonstrate arithmetic operators, comparison operator, and logical operator.
2.	Write PHP Script to print Fibonacci series.
3.	Write PHP Script to generate result and display grade.
4.	Write PHP script to obtain factorial of a number Using function
5.	Write PHP script to demonstrate string function.
6.	Write PHP script to demonstrate Date functions.
7.	Write PHP script to demonstrate Math functions.
8.	Write PHP script to demonstrate Array functions.
9.	Write PHP script to demonstrate File functions.
10.	Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.

BCA/Mn/T/250: Numerical Computation Methods

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1. To solve practical technical problems using various numerical method formulas
2. To derive appropriate numerical methods to solve algebraic, transcendental equations.
3. To know the numerical methods of solving simultaneous linear equations.
4. To acquire knowledge about forward differences and Backward differences and their relationship.
5. Knowledge about central difference operators and problems based on various central differences formulae.

Course Outcomes (COs) :

1. Develop structured and well-formed HTML documents.
2. Apply CSS to style elements and create visually appealing web pages.
3. Apply JavaScript to program at Client and Server end.
4. Implement semantic HTML for better accessibility and SEO.
5. Design professional and interactive web pages.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction** Mathematical Modeling, Characteristics, Error in Calculation, Significant Error , Absolute, Percentage Relative Error, Chopping off and Rounding off Error, Truncation Error, Propagation Error. **Matrices and Determinants.** Definitions, Matrix Operations, Determinant of Square Matrix, Cofactor, Adjoint of Matrix, Rank of Matrix **Numerical Solutions of Transcendental Equations** Concept of Iterative Methods, Search Method for Initial Guess. Bisection Method, False Position Method, Newton-Raphson Method	10 Hrs
II	**Elimination Methods for Solving Simultaneous Equations** Introduction and Matrix Notation of set of Equations,Gauss Elimination Method, Gauss Seidal Method, Matrix Inversion Method **Interpolation** Introduction and Polynomial Interpolation, Newton-Gregory Forward Difference Interpolation Formula, Newton-Gregory Backward Difference Interpolation Formula	10 Hrs
III	**Interpolation – II** Newton's divided Difference Interpolation, Lagrange's Interpolation **Least Square Curve Fitting** Best Fit and Criteria for Best Fit and Least Square Fit, Linear Regression.	10 Hrs

Text Books

1. "Numerical Computational Methods" - Dr. P.B.Patil, Narosa Publication House

Reference Books:

1. Numerical methods -S.C.Chapra, R.P.Canale-McGraw Hill
2. Numerical methods-E.Balguruswamy

BCA/Mn/T/ 251: Software Project Management

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.To learn and understand the principles of Software Engineering.

2.To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.

3.To apply design and testing principles to software project development.

Course Outcomes (COs) :

1.Analyze software requirements and formulate design solution for a software.

2. Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.

3. Model and design User interface and component-level

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to software engineering**, The Nature of Software, Defining Software, Software Engineering Practice. **Software Process:** A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, A Final Word on Evolutionary Processes. Unified Process, Agile software development: Agile methods, plan driven and agile development	**10 Hrs**
II	**Modeling**: Requirements Engineering, Establishing the Groundwork, Identifying Stakeholders, Recognizing Multiple Viewpoints, working toward Collaboration, Asking the First Questions, Eliciting Requirements, Collaborative Requirements Gathering, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements.	**10 Hrs**
III	**Estimation for Software Projects**: The Project Planning Process, Defining Software Scope and Checking Feasibility, Resources management, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem- Based Estimation, LOC-Based Estimation, FP-Based Estimation, Object Point (OP)-based estimation, Process- Based Estimation, Process Based Estimation, Estimation with Use Cases, Use-Case–Based Estimation, Reconciling Estimates, Empirical Estimation Models, The Structure of Estimation Models, The COCOMO II Mode, Preparing Requirement Traceability Matrix.	**10 Hrs**

Text Books

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill,
2. Ian Sommerville, "Software Engineering", Addison and Wesley

Reference Books:

1. Carlo Ghezzi, "Fundamentals of Software Engineering"
2. Pankaj Jalote, "An Integrated Approach to Software Engineering"l, Springer

BCA/GE/OE/T/250: Fundamental of Computer Network

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.The main objective of this course is to make the student learn the design of computer networks.

Course Outcomes (COs) :

1. Understand Basics of Computer Networks and different Transmission Media.
2. Differentiate Protocols which play a major role in providing internet effectively.
3. Understand various protocol layers and inner operations.
4. Understand architectures of network protocols.
5. Understand security issues in network protocols.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**NETWORK MODELS**: Layered Tasks, WAN, LAN, MAN, OSI model, TCP/ IP protocol stack, addressing ,Novell Networks Arpanet, Internet. **PHYSICAL LAYER**: Transmission media: copper, twisted pair, wireless; switching and encoding asynchronous communications; Narrow band ISDN, broad band ISDN and ATM. **DATA LINK LAYER**: Design issues, framing, error detection and correction, CRC, Elementary data link protocols, Sliding Window Protocol, Slip, HDLC, Internet, and ATM.	**10 Hrs**
II	**MEDIUM ACCESS SUB LAYER**: Random access, Controlled access, Channelization, IEEE 802.X Standards, Ethernet, wireless LANS, Bridges. **NETWORK LAYER**: Network Layer Design Issues, Routing Algorithms, Internetworking, Network Layer in Internet. (Text book- **CONGESTION CONTROL**: General Principles, policies, traffic shaping, flow specifications, Congestion control in virtual subnets, choke packets, loads shedding, jitter control.	**10 Hrs**
III	**TRANSPORT LAYER**: Transport Services, Elements of Transport Protocols, Internet Transport Protocols (TCP & UDP); ATM AAL Layer Protocol. **APPLICATION LAYER**: Network Security, Domain name system, SNMP, Electronic Mail: the World WEB, Multi Media	**10 Hrs**

Text Books

1. Andrew S Tanenbaum: Computer Networks ,6th Edition. Pearson Education/PI, 2012.
2. Behrouz A. Forouzan : Data Communications and Networking, 4 th Edition TMH, 2012.

Reference Books:

1 . S.Keshav: An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education, 2001.
2. William, A. Shay : Understanding communications and Networks, 3rd Edition, Thomson Publication, 2006

BCA/SEC/T/250: Python-I

Total Credits : 02 Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

1.Understand the basic concepts of Python programming.
2. Learn about Python's built-in data types and their applications.
3.Work with file input/output operations.
4.Implement exception handling for robust programs.

Course Outcomes (COs) :

1.To understand why Python is a useful scripting language for developers.
2.To learn how to design and program Python applications.
3.To learn how to use lists, tuples, and dictionaries in Python programs
4.To learn how to identify Python object types
5.To learn how to use indexing and slicing to access data in Python programs
6.To define the structure and components of a Python program.
7.To learn how to write loop and decision statements in Python

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Python and Basic Programming** Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errers, Experimental Debugging, Formal and Natural Languages. The Difference Between Brackets, Braces, and Parentheses **Conditional Statements:** if if-else, nested if-else, Looping for, while, nested loops **Control statements:** Terminating loops, skipping specific conditions	**10 Hrs**
II	**Python Functions, List , Dictionary, String Functions**: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Function, Why Functions? Return Values, **Strings:** A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, **List:** Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from Lint, Built-in Last Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods **Dictionary**: Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods	**10 Hrs**
III	**Tuples**: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions **File Handling** in Python, Reading and Writing Files, Working with Text and Binary Files, File Modes and Methods, Exception Handling in File	**10 Hrs**

	Operations. Understanding Errors and Exceptions, Try, Except, Finally Blocks, Handling Multiple Exceptions, Raising Custom Exceptions	

Text Books

1.Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

2. William, A. Shay : Understanding communications and Networks, 3rd Edition, Thomson Publication, 2006.

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education 2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

BCA/SEC/P/ 276: Practical based on BCA/DSC/T/250(Python-I)	
Total Credits : 02 Hours : 60 Hrs Maximum Marks : 50	
Sample List of experiments to be carried out based on the course BIT/VSC/T/201	
1	Write a Python program to demonstrate syntax errors, runtime errors, and logical errors.
2	Use print statements and debugging techniques to identify errors in a sample program.
3	Develop a Python program to determine whether a given number is even, odd, or prime.
4	Write a Python script to demonstrate break, continue, and pass statements in loops.
5	Implement a simple menu-driven program that allows the user to choose different loop control operations.
6	Create a Python function to compute the factorial of a number using both recursion and iteration.
7	Write a function to check whether a given string is a palindrome or not.
8	Implement a Python program to perform string slicing, searching, and manipulation (counting vowels, removing spaces, and reversing).
9	Write a program to compare two strings and check if they are anagrams
10	Write a Python program to perform CRUD operations on a list (add, delete, search, and update elements).
11	Implement a Python program to merge two lists and sort them in ascending order
12	Create a dictionary to store student records (Name, Roll Number, Marks) and perform search, update, and delete operations.
13	Implement a Python program to count the frequency of words in a given text using a dictionary.
14	Implement a Python program to count the frequency of words in a given text using a dictionary.
15	Write a Python program to demonstrate basic tuple operations such as concatenation, repetition, and slicing.
16	Implement a program to return multiple values from a function using tuples
17	Write a Python program to create a text file, write user input into it, and read the content line by line.
18	Develop a program to store student records in a binary file and retrieve data based on user input.
19	Implement a Python script to copy contents from one file to another using binary mode.
20	Write a Python program to handle multiple exceptions (ZeroDivisionError, ValueError, etc.).

BCA/SEC/T/ 251: Web Designing

Total Credits : 01 Hours : 15 Hrs

Maximum Marks : 50

Prerequisite : Knowledge of HTML, CSS and Java script in essential

Learning Objectives of the Course

i) To learn designing a responsive web site using tool like Bootstrap
ii) Bootstrap Page Structure, Grid System, Layouts
iii) Bootstrap Typography, Styling Images, Tables, Buttons, Badges, & Progress Bars
iv) Bootstrap Pagination, Panels, Menus & Navigation Bars
v) Bootstrap Carousel & Modals, Scrollspy, Themes

Course Outcomes (COs) :

After completion of the course, students will be able to -

i) Students learn to create the front-end component of mobile-responsive web applications, using the Bootstrap framework.
ii) Able to design a web applications adhere to strict development standards to avoid cross-browser and cross-device compatibility issues.
iii) To embedding Bootstrap into web pages, explore the Bootstrap Grid system and popular mobile responsive web layouts.
iv) Students will gain a solid understanding of almost every Bootstrap component available, from typography, carousels, panels, drop-down menus, and collapsible nav-bars to forms, popovers, modals and tool tips.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Bootstrap, Bootstrap file Structure, HTML templates and Global style Bootstrap default Grid System, Fluid Grid system, Content Layouts, responsive designing. Bootstrap CSS Typography, Code, Tables classes. Form layout, control, sizing and states. Buttons, Images and icons.	05 Hrs
II	Layout Components: Dropdown Menus, button groups, buttons with dropdown. Navigation Elements- tabular menu , Pills menu, stackable menu, Dynamic Tabs and Pills navigation list, Bootstrap Collapse Panel, Bootstrap Collapse List Group. Navigation bar, menu and links. Pager and Pagination. Labels, badges, Typographic Elements, thumbnails.	05 Hrs
III	JavaScript Plugins: Programming API, transitions, Modal, Dropdown, scrollspy, toggaleable tabs tooltips, popover, alerts, Buttons, collapse, Photoshop templates, Themes.	05 Hrs

Text Book

1. Responsive web development Bootstrap by Jack Superlock O'Reilly publication.

Reference Book

1. Learn Bootstrap Web Design by Aadishree Avinash Pagar
2. Bootstrap 5 Foundations by Daniel Charles Foreman

BCA/SEC/P/ 277: Practical based on BCA/SEC/T/ 251 (Web Designing)	
Total Credits : 01 Maximum Marks : 50	Hours : 30 Hrs
Sample List of experiments to be carried out based on the course BCA/SEC/T/ 251	
1	Practical to demonstrate use of tables,
2	Practical to demonstrate use of Styling Images
3	Practical to demonstrate use of Bootstrap Jumbotron
4	Practical to demonstrate use of Bootstrap Wells and Alerts
5	Practical to demonstrate use of Bootstrap Buttons, Button Groups, Justified Button Groups
6	Practical to demonstrate use of Bootstrap Glyphicons
7	Practical to demonstrate use of Bootstrap Badges and Labels
8	Practical to demonstrate use of Bootstrap Progress Bars,
9	Practical to demonstrate use of Pagination, Pager Pagination
10	Practical to demonstrate use of List Groups, Panels,
11	Practical to demonstrate use of Bootstrap Dropdown Menus,
12	Practical to demonstrate use of Bootstrap Collapsibles, Bootstrap Collapse Panel, Bootstrap Collapse List Group
13	Practical to demonstrate use of Bootstrap Tab Menus, Pill Menus, Dynamic Tabs and Pills.
14	Practical to demonstrate use of Bootstrap Navigation Bar, Collapsible Navigation bar.
15	Practical to demonstrate use of Bootstrap Forms - Vertical and Inline, Inputs, Form Control States,
16	Practical to demonstrate use of Bootstrap Input Sizing, Carousel, Tooltip