Assam University, Silchar

Four Year Undergraduate Programme

Implemented under NEP 2020

Effective from the Academic Year 2023-24

Syllabus of Computer Application
(3rd Year)

Approved in the 99th meeting of the Academic Council on 22.05.2025 vide Resolution No AC:99:05-25:5

Programme Specific Outcome

Bachelor in Computer Application with Honours/Honours and Research

Computer Application (CA) has been evolving as an important branch of Science and Technology in last two decade and it has carved out a space for itself like Computer Science and Engineering. Computer Application spans theory and more application and it requires thinking both in abstract terms and in concrete terms. The ever-evolving discipline of Computer Application has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers and its applications, but finding a solution requires both computer science expertise and knowledge of the particular application domain. BCA and BCA (Hons) are aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in CS or MCA leading to research as well as R&D, can be employable at IT industries, or can pursue a teaching profession or can adopt a business management career. BCA and BCA (Hons) aims at laying a strong foundation of computer application at an early stage of the career. There are several employment opportunities and after successful completion of BCA, graduating students can fetch employment directly in companies as programmer, Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The present Curriculum Framework for BCA degrees is intended to facilitate the students to achieve the following.

1. Students will have a comprehensive understanding of computer science principles, programming languages, software development methodologies, and data structures.
2. Students will be proficient in one or more programming languages and possess the ability to develop software applications, write efficient code, and solve programming problems.
3. BCA graduates will have strong analytical and problem-solving skills, allowing them to identify and resolve complex computing problems through the application of logical reasoning and critical thinking.
4. Graduates will be capable of designing, developing, and testing software applications using appropriate software engineering principles and methodologies.
5. Students will acquire knowledge and skills in designing and managing databases, including the ability to create database schemas, query data, and ensure data integrity.
6. BCA graduates will have effective oral and written communication skills, enabling them to collaborate with clients, understand requirements, and document software projects accurately.
7. Students will be adept at working in multidisciplinary teams, demonstrating the ability to communicate, cooperate, and contribute to team projects effectively.
8. Graduates will understand the principles of information security and possess knowledge of techniques to secure computer systems, networks, and applications.
9. BCA graduates will be aware of ethical considerations related to computer science and information technology and demonstrate a commitment to professional and ethical practices.
10. Students will be equipped with a strong foundation that allows them to adapt to emerging technologies, learn new programming languages, and continuously update their skills to keep pace with the evolving field of computer science.

Table 1: Semester wise list of Computer Application DSC Courses

Semester	Course Code	Title of the Courses	Credits
I	CADSC101	Fundamentals of Information Technology	3
	CADSC102	Discrete Mathematics	3
II	CADSC151	Data Structure	3
	CADSC152	Lab on Data Structure	3
III	CADSC201	Computer Organization and Architecture	4
	CADSC202	Operating System	4
IV	CADSC251	Programming with Java	4
	CADSC252	Database Management System	4
	CADSC253	Lab on Java Programming & DBMS	4
V	CADSC301	Computer Graphics and C++	4
	CADSC302	System Analysis and Design	4
	CADSC303	Lab on Computer Graphics and C++	4
VI	CADSC351	Computer Network and Internet Technology	4
	CADSC352	E-Commerce and Cyber Security	4
	CADSC353	Programming with PHP	4
	CADSC354	Lab on PHP & Network Programming/Project Work	4
VII	CADSC401	Design and Analysis of Computer Algorithms	4
	CADSC402	Theory of Computation and Compiler Design	4
	CADSC403	Artificial Intelligence	4
	CADSC404	Lab on DACA & Compiler Design	4
VIII	CADSC451	(A) Research Methodology OR (B) Software Engineering	4
	CADSC452	(A) Image Processing OR (B) Data Analytics	4
	CADSC453	Natural Language Processing	4
	CADSC454	(A) Internet of Things OR (B) Cloud Computing	4
	CADSC455	Research Project/Dissertation	12

Table 2: Semester wise list of Computer Application DSM Papers

Semester	DSM1/DSM2	Course Code	Title of Courses	Credits
I	DSM 1	CADSM101	Programming with C	3
II	DSM 2	CADSM151	Programming with C	3
III	DSM 1	CADSM201	Database Management System	4
IV	DSM 1	CADSM251	Lab on C & DBMS	3
	DSM 2	CADSM252	Database Management System	3
V	DSM 1	CADSM301	Computer Graphics	3
	DSM 2	CADSM302	Computer Graphics	3
VI	DSM 2	CADSM351	Lab on C & DBMS	4
VII	DSM 1	CADSM401	Internet Technology	4
VIII	DSM 2	CADSM451	Internet Technology	4

Table 3: Semester wise list of Computer Application SEC Courses

Semester	Course Code	Title of Courses	Credits
I	CASEC101	Programming with C	3
II	CASEC151	Python Programming	3
III	CASEC201	Web Programming	3

Table 4: Semester wise list of Computer Application IDC Courses

Semester	Course Code	Name of the Paper	Credits
I	CAIDC101	Fundamentals of Information Technology	3
II	CAIDC151	Programming Fundamentals with C	3
III	CAIDC201	Introduction to Web Designing & Cyber Security	3

Syllabi of Computer Application DSC Courses

Semester : V
Course Type : DSC
Course Code : CADSC301
Name of the Course : Computer Graphics and C++
Learning level : Higher-level Course
Credits : 4
Contact Hours : 60
Total Marks : 100
End Semester Marks : 70
Internal Marks : 30

Course Objectives: The course objective is to

1. *Understand the basic principles of graphics algorithm design.*
2. *Familiarize the functionality of display devices.*
3. *Introduce how graphics hardware and software work in real work applications.*
4. *Understand the various algorithms for drawing structures and shapes.*
5. *Relate projection of an object in real world scenario.*
6. *Familiarize with the basics of C++ programming language and the concepts of functions and program structure in C++*
7. *Explain the concept and working of class, object in C++*
8. *Introduce the concepts of object-oriented programming*

Unit-I

Introduction: Basic elements of Computer graphics, Applications of Computer Graphics. RGB, YIQ and CMY color models; **Graphics Hardware:** Architecture of Raster and Random scan display devices; **Fundamental Techniques in Graphics:** Raster-scan line and circle drawing; Polygon filling, inside-outside test, boundary and flood-fill.

Unit-II

2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (Cohen-Sutherland), polygon clipping.

Unit-III

3D transformation and viewing: Bazier curves and surfaces, B-spline curves and surfaces; 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation; **Concept of Animation and Morphing**.

Unit-IV

Introduction to C++: History of C++, Object-Orientation Programming Paradigm, Basic concepts of Object-Orientation Programming; **Classes and Objects**: Defining & Using Classes, Class Variables & Member Functions, **Constructors, Destructors**; Inline Functions, Friend Function, Functions parameters; Constructor Overloading, Function overloading.

Unit-V

Operator Overloading: Defining Operator Overloading, Rules for Overloading Operators, Overloading Unary and Binary Operators; **Inheritance**, types of inheritance; Virtual Base Classes, Abstract Classes; **Virtual Functions and polymorphism.**

Course Learning Outcomes*: After successful completion of the course, the students will be able to:*

1. *Apply output primitive's algorithm to create graphics.*
2. *Implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping and Illustrate basic graphics application programs.*
3. *Perform basic projects in graphics and conceive the idea of 3D graphics & views.*
4. *Understand Object-Oriented Programming Paradigm*
5. *Develop problem-solving skills and the ability to implement and debug C++ programs*

Text Books:

1. D. Hearn, Baker: "Computer Graphics", Prentice Hall of India 2008.
2. D. F. Rogers: "Procedural Elements for Computer Graphics", McGraw Hill 1997.
3. E Balaguruswamy, "Object Oriented Programming with C++", 8th Edition, Tata McGraw-Hill Education, 2020.
4. R. S. Salaria, "A Complete Reference to C++ Language" 1st Edition, Khanna Book Publishing Company, 2017

Reference Books:

1. D. F. Rogers, Adams: "Mathematical Elements for Computer Graphics", McGraw Hill 2nd edition 1989.
2. D. P. Mukherjee: "Fundamentals Of Computer Graphics And Multimedia", PHI Learning, 1st Edition.
3. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Pearson, 2022.

Semester	**: V**
Course Type	**: DSC**
Course Code	**: CADSC302**
Name of the Course	**: System Analysis and Design**
Learning level	**: Higher-level Course**
Credits	**: 4**
Contact Hours	**: 60**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course Objectives: The course objective is to

1. *Equip students with the knowledge and skills necessary to analyze, design, develop, and implement information systems.*
2. *Understand System Development Life Cycle (SDLC), Requirement Analysis, Problem Solving & Decision Making, Software Development Approaches, User Interface Design, etc.*
3. *Understand project management principles and documentation in system development.*

UNIT-I

The system Concept: Elements of a system, types of system. Introduction to system development life cycle, Recognition of need, prototyping, Roles of system Analyst, The analyst/ user interface.

UNIT-II

Introduction to system analysis: Determining the user's information requirements, problem definition, Background analysis, fact-finding, fact analysis. Introduction to structured analysis, the tools of structured analysis, Feasibility study; oral representation, data analysis, Cost/ Benefit analysis, the system proposal.

UNIT-III

Introduction to system designs: The process of design (logical and physical design), design methodology, structured design, structured walkthrough, major development activities, data validation. Introduction to input design, output design, forms design; File structure, File organization, Data Base design, and the role of DBA.

UNIT-IV

Introduction to system testing: The Test Plan, Quality assurance; System Conversion, Post implementation review, Software maintenance.

UNIT-V

Procedure for Hardware/Software selection: Project Management and Control, project control, gantt chart, PERT and CPM.

***Course Learning Outcomes**: After successful completion of the course, the students will be able to:*

1. *Explain the importance and role of system analysis and design in information systems development.*
2. *Identify and gather system requirements from stakeholders using various techniques.*
3. *Create Data Flow Diagrams (DFD), Entity-Relationship Diagrams (ERD), and Use Case Diagrams to represent system models*

Text Book

1. Elias. M. Awad, **System Analysis and Design**, 2nd edition, Galgotia Publication, 1993.
2. Kenneth e. Kendall , julie e. Kendall, **Systems analysis and design,** 7th edition, pearson publication
3.

Reference Books:

1. Kendall and Kendall, System analysis and Design, PHI, 2006.
2. Igor Hawryszkiewycz, Introduction to System analysis and Design, PHI, 2010.

Semester	**: V**
Course Type	**: DSC**
Course Code	**: CADSC303**
Name of the Course	**: Lab on Computer Graphics and C++**
Learning level	**: Higher-level Course**
Credits	**: 4**
Contact Hours	**: 60**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course Objectives:

1. *Explain the basics of computer graphics and its applications.*
2. *Explain the methods to plot and trace various shapes like line, circle, ellipse etc.*
3. *Understand the implementation of various clipping and filling algorithms*
4. *Gain knowledge about practical implementations of 2D and 3D transformations and viewing.*
5. *Provide students with hands-on experience in writing C++ Programs and to understand and apply fundamental programming concepts such as control structures, functions, and input/output operations in C++.*

6. *Gain knowledge about practical implementations of constructors and destructors and understand the implementation of object-oriented concepts including inheritance and polymorphism*

This paper provides practical knowledge of Graphics Programming and C++ Programming. List of laboratory programming assignments (not limited to these):

Lab on Graphics Programming

1. Write a C/C++ program to implement DDA line drawing algorithm
2. Write a C/C++ program to implement Bresenham‘s line drawing algorithm
3. Write a C/C++ program to implement mid-point circle drawing algorithm
4. Write a C/C++ program to implement the mid-point ellipse drawing algorithm.
5. Write a C/C++ program to implement Cohen Sutherland Line Clipping algorithm.
6. Write a C/C++ program to clip a polygon using Sutherland Hodgeman algorithm.
7. Write a C/C++ to implement Scan-Line Polygon Filling Algorithm.
8. Write a C/C++ program to apply various 2D transformations on a 2D object (use homogenous coordinates).
9. Write a C/C++ program to apply various 3D transformations on a 3D object and then apply parallel projection on it.
10. Write a C/C++ program to apply various 3D transformations on a 3D object and then apply perspective projection on it.
11. Write a C/C++ program to draw a circle of red colour inside of a rectangle of blue colour on a background of green colour.
12. Write a C/C++ program to draw Bezier curve.
13. Write a C/C++ program to draw B-spline curve.

Lab on C++ Programming

1. Write a C++ Program to Check Whether a Number is Palindrome or Not
2. Write a C++ Program to Multiply Two Matrix.
3. Write a C++ Program to Find Largest Element of an Array
4. C++ program to create a class for student to get and print details of a student.
5. C++ program to demonstrate example of friend function with class.
6. C++ program for Banking Management System using Class.
7. C++ Program to calculate Volume of Cube using constructor and destructor
8. C++ Program to determine the Area of Rectangle using constructors
9. C++ Program to enter student details by Passing parameters to constructors
10. C++ Program to demonstrate Constructor Overloading
11. C++ Program To calculate Volume of Box using Constructor
12. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes.

Course Learning Outcomes: After successful completion of the course, the students will be able to:

1. Write programs to display various shapes like line, rectangles, circles, ellipse etc.
2. Perform the transformations of objects using translation, scaling and rotation cases.
3. Perform transformations.
4. Create and execute graphical models.

Semester	**: V**
Course Type	**: DSM**
Course Code	**: CADSM301**
Name of the Course	**: Computer Graphics**
Learning level	**: Higher-level Course**
Credits	**: 3**
Contact Hours	**: 45**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course Objectives: The course objective is to

1. *Understand the basic principles of graphics algorithm design.*
2. *Familiarize the functionality of display devices.*
3. *Introduce how graphics hardware and software work in real work applications.*
4. *Understand the various algorithms for drawing structures and shapes.*
5. *Relate projection of an object in real world scenario.*

Unit-I

Introduction: Basic elements of Computer graphics, Applications of Computer Graphics. **Graphics Hardware:** Architecture of Raster and Random scan display devices, input/output devices.

Unit-II

Fundamental Techniques in Graphics: Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, inside-outside test, boundary and flood-fill.

Unit-III

2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland), polygon clipping.

Unit-IV

3D transformation and viewing: Bezier curves and surfaces, B-spline curves and surfaces. 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

Unit-V

Visible surface detection concepts: back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models. Concept of Animation and Morphing.

Course Learning Outcomes*: After successful completion of the course, the students will be able to:*

1. *Apply output primitive's algorithm to create graphics.*
2. *Implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.*
3. *Illustrate basic graphics application programs.*
4. *Perform basic projects in graphics.*
5. *Conceive the idea of 3D graphics & views.*
6. *Extend the application of graphics for other image processing*

Text Books:

1. D. Hearn, Baker: "**Computer Graphics**", Prentice Hall of India 2008.
2. D. F. Rogers: "**Procedural Elements for Computer Graphics**", McGraw Hill 1997.
3. J. D. Foley, A.Van Dan, Feiner, Hughes: "**Computer Graphics Principles & Practice**", 2nd Edition, Addison Wesley 1990.

Reference Books:

1. D. F. Rogers, Adams: "**Mathematical Elements for Computer Graphics"**, McGraw Hill 2nd edition 1989.
2. D. P. Mukherjee: "**Fundamentals Of Computer Graphics And Multimedia**", PHI Learning, 1st Edition.

Semester : V
Course Type : DSM
Course Code : CADSM302
Name of the Course : Computer Graphics
Learning level : Higher-level Course
Credits : 3
Contact Hours : 45
Total Marks : 100
End Semester Marks : 70
Internal Marks : 30

Course Objectives: The course objective is to

1. *Understand the basic principles of graphics algorithm design.*
2. *Familiarize the functionality of display devices.*
3. *Introduce how graphics hardware and software work in real work applications.*
4. *Understand the various algorithms for drawing structures and shapes.*
5. *Relate projection of an object in real world scenario.*

Unit-I

Introduction: Basic elements of Computer graphics, Applications of Computer Graphics. **Graphics Hardware:** Architecture of Raster and Random scan display devices, input/output devices.

Unit-II

Fundamental Techniques in Graphics: Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, inside-outside test, boundary and flood-fill.

Unit-III

2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky), polygon clipping.

Unit-IV

3D transformation and viewing: Bezier curves and surfaces, B-spline curves and surfaces. 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

Unit-V

Visible surface detection concepts: back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models. Concept of Animation and Morphing.

Course Learning Outcomes*: After successful completion of the course, the students will be able to:*

1. *Apply output primitive's algorithm to create graphics.*
2. *Implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.*
3. *Illustrate basic graphics application programs.*
4. *Perform basic projects in graphics.*
5. *Conceive the idea of 3D graphics & views.*
6. *Extend the application of graphics for other image processing*

Text Books:

1. D. Hearn, Baker: "**Computer Graphics**", Prentice Hall of India 2008.
2. D. F. Rogers: "**Procedural Elements for Computer Graphics**", McGraw Hill 1997.
3. J. D. Foley, A.Van Dan, Feiner, Hughes: "**Computer Graphics Principles & Practice**", 2nd Edition, Addison Wesley 1990.

Reference Books:

1. D. F. Rogers, Adams: "**Mathematical Elements for Computer Graphics"**, McGraw Hill 2nd edition 1989.
2. D. P. Mukherjee: "**Fundamentals Of Computer Graphics And Multimedia**", PHI Learning, 1st Edition.

Semester : VI
Course Type : DSC
Course Code : CADSC351

Name of the Course : **Computer Network and Internet Technology**
Learning level : **Higher-level Course**
Credits : **4**
Contact Hours : **60**
Total Marks : **100**
End Semester Marks : **70**
Internal Marks : **30**

Course Objectives: The course objective is to

1. *Understand the basic concepts, principles, and terminologies of computer networks and internet technology.*
2. *Develop an understanding of IP addressing (IPv4 & IPv6), subnetting, and network addressing schemes.*
3. *Explore the concepts of static routing, along with switching techniques used in modern networks.*
4. *Explore the architecture of the internet, DNS, HTTP/HTTPS, FTP, and cloud computing fundamentals.*
5. *Gain knowledge of web technologies including HTML, CSS, JavaScript, and web frameworks for website development.*

UNIT I

Introduction to Computer Networks: Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite; Analog and digital signal; Encoding schemes; Multiplexing techniques- FDM, TDM; Circuit switching and packet switching; transmission media.

UNIT II

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; Error recovery protocols- stop and wait ARQ, go-back-n ARQ; Aloha- pure and slotted, CSMA,CSMA/CD protocols; **Networks Layer Functions and Protocols: Logical addressing, subnetting and supernetting,** Routing; link state, distance vector, virtual private network.

UNIT III

Transport Layer Functions and Protocols : Transport services-error and flow control, Connection establishment and release- three way handshaking; **Overview of Application layer protocol:** Overview of DNS protocol; domain name and their organisation, understanding the Internet protocol address, Client-server concept- architecture and application. overview of WWW & HTTP protocol.

UNIT IV

Internet: structure of internet, history of internet; Internet protocol; Addressing in Internet; understanding the Internet protocol address, Client-server concept- architecture and application.

HTML: HTML Basic, HTML tags, creating list in HTML, hyperlinks, multimedia, HTML forms, tables in HTML, style sheets in HTML; **XML**: XML-Introduction, Need for XML, Advantages.

UNIT V

Creating interactive and dynamic web pages with JavaScript: Client-side scripting languages, JavaScript overview; constants, variables, operators, expressions and statements; user-defined & built-in-functions; properties and methods of built-in objects, client-side form validation.

***Course Learning Outcomes**: After successful completion of the course, the students will be able to:*

1. *Able to explain the key concepts, components, and functions of computer networks and internet technologies.*
2. *Demonstrate knowledge of the OSI and TCP/IP models and their associated protocols such as IP, TCP, UDP, HTTP, DNS, and FTP.*
3. *Able to understand the web development tools along with different markup and scripting languages.*

Text Books:

1. B. A. Forouzan, **Data Communications and Networking**, 4th edition, THM, 2007.
2. S. Tanenbaum, **Computer Networks**, 4th edition, PHI , 2002
3. Laura Lemay, **Mastering HTML, CSS & Java Script web publishing**, BPB, 2016.
4. Thomas Powell, **HTML & CSS: The Complete Reference**, 5th Edition, TMH, 2017.

Reference Books:

1. Kurose, **Computer Networking**, 8th edition, Pearson, 2022.
2. Larry L. Peterson and Bruce S. Davie, **Computer Networks: A Systems Approach**, 6th Edition, Morgan Kaufmann Pub, 2021.
3. J. Jaworski, **Mastering JavaScript and Jscript**, BPB Publication, 2007.

Semester	**: VI**
Course Type	**: DSC**
Course Code	**: CADSC352**
Name of the Course	**: E-Commerce and Cyber Security**
Learning level	**: Higher-level Course**
Credits	**: 4**
Contact Hours	**: 60**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course Objectives: *The course objective is to*

1. *Understand the basic concepts, evolution, and significance of electronic commerce in the digital economy.*
2. *Explore and analyze different types of e-commerce models, including B2B, B2C, C2C, and C2B.*
3. *Implement Digital Payment Systems including credit cards, digital wallets, crypto-currency, and mobile banking.*
4. *Understand Online Security & Legal Issues about cyber-security threats, data protection laws, digital signatures, and privacy policies in e-commerce.*
5. *Learn the foundations of Cyber security and threat landscape.*
6. *Equip students with the technical knowledge and skills needed to protect and defend against cyber threats.*
7. *Develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.*
8. *Expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security.*
9. *Expose students to responsible use of online social media networks.*
10. *Systematically educate the necessity to understand the impact of cyber crimes and threats with solutions in a global and societal context.*

UNIT I

Introduction to E-Commerce: Definition of E-Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, forces behind e-commerce, Industry Framework, Brief history of e-commerce, Inter organizational e-commerce, intra organizational E-commerce, consumer to Business Electronic commerce Architectural frame work. Network Infrastructure for e-commerce, Market forces behind I-Way, Component of I-Way, access Equipment, Global Information Distribution Network Broad band Telecommunication. **Mobile Commerce:** Introduction to mobile commerce, Mobile computing Applications, Wireless Application protocols, WAP technology, Mobile information devices.

UNIT II

Net Commerce: EDI, EDI Application in Business, legal requirement in E commerce, Introduction to Supply Chain management, CRM, issues in Customer Relationship management. **Digital Payments:** Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments

related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payament Settlement Act,2007,

UNIT III

Introduction to Cyber security: Defining Cyberspace, Introduction to internet, web technology and www, Architecture of cyberspace, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.**Cyber crime and Cyber law:** Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.

UNIT IV

Social Media Overview and Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.

UNIT V

Digital Devices Security , Tools and Technologies for Cyber Security: End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

***Course Learning Outcomes**: After successful completion of the course, the students will be able to:*

1. *Understand the fundamental principles, business models and applications of e-commerce.*
2. *Analyze and use different online payment methods.*
3. *Identify security threats, fraud prevention techniques, data protection laws, and ethical concerns in e-commerce.*
4. *Understand the concept of Cyber security and issues and challenges associated with it.*
5. *Understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.*

6. *Appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.*
7. *Understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.*
8. *Understand the basic security aspects related to Computer and Mobiles. They will be able to use basic tools and technologies to protect their devices.*

Text Books:

1. Ravi Kalakota and Andrew Whinston, **Fronticrs of Electronic Commerce**, Addison Wesly, 4th Edition, 2012.
2. Carol Guercio Traver Kenneth C. Laudon**, E-Commerce 2021: Business, Technology, and Society**, 17e, 2022.
3. R. C Mishra**, Cyber Crime Impact in the New Millennium**, Auther Press. Edition 2010.
4. Sumit Belapure and Nina Godbole**, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives**, Wiley India Pvt. Ltd. (1st Edition, 2011)
5. Henry A. Oliver**, Security in the Digital Age: Social Media Security Threats and Vulnerabilities**, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)

Reference Books:

1. Debial Amor, **The e business revolution**, Addison Wesly, 5th edition , 2007.
2. Sokol, From **EDI to Electronic Commerce: A business Initiative**, TMH, 7th edition, 2010.
3. Elias M. Awad**, Electronic Commerce**, Prentice Hall of India Pvt Ltd.
4. **Cyber Laws: Intellectual Property & E-Commerce Security** by Kumar K, Dominant Publishers.
5. Eric Cole, Ronald Krutz, James W. Conley**, Network Security Bible**, 2nd Edition, Wiley India Pvt. Ltd.
6. E. Maiwald, **Fundamentals of Network Security**, McGraw Hill.

Semester : VI
Course Type : DSC
Course Code : CADSC353
Name of the Course : Programming with PHP
Learning level : Higher-level Course
Credits : 4

Contact Hours : 60
Total Marks : 100
End Semester Marks : 70
Internal Marks : 30

Course Objectives: The course objective is to

1. *Equip students with the skills and knowledge needed to develop dynamic web applications using PHP.*
2. *Develop Server-Side Applications and implement dynamic web pages and applications using PHP and MySQL.*
3. *Manage Forms & User Input i.e. handles HTML forms, GET & POST methods, form validation, and data sanitization for secure input processing.*
4. *Work with PHP Functions & Arrays i.e. create and utilize built-in and user-defined functions, associative arrays, and multidimensional arrays.*
5. *Implement Database Connectivity i.e. use MySQL (or MariaDB) with PHP for storing, retrieving, updating, and deleting data using SQL queries and PDO/MySQLi.*
6. *Apply Sessions & Cookies i.e. manage user authentication, sessions, and cookies to maintain user data across web pages.*

Unit I

Introduction to PHP: Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression. Decisions and loop Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with HTML.

Unit II

Function: What is a function, Define a function, Call by value and Call by reference, Recursive function; **String:** Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function. **Array:** Anatomy of an 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.

Unit III

Handling Html Form with PHP: Capturing Form, Data Dealing with Multi-value filed, and generating file uploaded form, redirecting a form after submission; **Understanding file and directory:** Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Unit IV

Session and Cookie: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP; Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session. **Exception Handling**: Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

Unit V

Database Connectivity with MySQL: Introduction to RDBMS, Connection with MySQL Database, Performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query, Join (Cross joins, Inner joins, Outer Joins, Self joins).

Course Learning Outcomes*: After successful completion of the course, the students will be able to:*

1. *Write and execute basic PHP scripts, including variables, data types, operators, and control structures.*
2. *Handle Forms & User Input Securely.*
3. *Manage Sessions & Cookies.*
4. *Create interactive and data-driven web applications using PHP and MySQL.*

Text Books:

1. Steven Holzner, PHP: The Complete Reference Paperback, McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited, 2008.

Reference Books:

1. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, 3rd Edition Paperback, O'reilly, 2014.
2. Luke Welling, Laura Thompson, PHP and MySQL Web Development, 4th Edition, Addition Paperback, Addison-Wesley Professional, 2008.
3. David Sklar, Adam Trachtenberg, PHP Cookbook: Solutions & Examples for PHP Programmers, 2014.

Course Type	**: DSC**
Course Code	**: CADSC354**
Name of the Course	**: Lab on PHP & Network Programming/Project Work**
Learning level	**: Higher-level Course**
Credits	**: 4**
Contact Hours	**: 60**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course Objectives:

1. *Understand Network Protocols & Sockets*
2. *Understand the simulation methods to implement CRC, stop and wait protocol etc.*
3. *Understand the simulation methods to implement distance vector routing algorithm, Dijkstra algorithm for shortest path routing etc.*
4. *Implement **server-side scripting** to create interactive and data-driven web applications*
5. *Integrate PHP with Databases*

This paper provides practical knowledge of PHP and Network Programming. List of laboratory programming assignments (not limited to these):

Lab on PHP Programming

1. Write a program to find greatest of three numbers.
2. Write a program to find gross salary of a person
3. Write a program to find grade of a student given his marks.
4. Write a program to find divisor or factorial of a given number.
5. Write a program to print first ten natural numbers.
6. Write a program to print first ten even and odd numbers.
7. Implement the PHP/MySQL concepts listed in theory.
8. Implement some exercises of semester using PHP as front end.

Lab on Network Programming

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.
7. WAP to find the address of the local machine
8. WAP A program that prints the address of www.youtube.com
9. WAP A program that prints all the addresses of www.youtube.com.
10. Write a program to testing the characteristics of an IP address i.e. you have to check whether given address is Any Local Address, Loop back Address, Link Local Address, Site Local Address or Multicast Address

* The Department may offer a "Project Work" in lieu of the Lab on PHP Programming and Lab on Network Programming for the students under allocated Project Supervisors as per the existing rules of Assam University, Silchar. (AC Resolution: 99: 05-25:26.8)

***Course Learning Outcomes**: After successful completion of the course, the students will be able to:*

1. *Demonstrate knowledge of different network protocols.*

2. *Develop and debug PHP programs*
3. *Handle GET & POST requests, validate input, and manage file uploads*
4. *Develop database oriented web applications.*

Semester	**: VI**
Course Type	**: DSM**
Course Code	**: CADSM351**
Name of the Course	**: Lab on C & DBMS**
Learning level	**: Higher-level Course**
Credits	**: 4**
Contact Hours	**: 60**
Total Marks	**: 100**
End Semester Marks	**: 70**
Internal Marks	**: 30**

Course objective:

1. *Develop proficiency in C programming language by implementing various programming tasks.*
2. *Understand memory management concepts in C, including dynamic memory allocation.*
3. *Gain a basic understanding of Database Management System (DBMS) concepts.*
4. *Understand the basics of Structured Query Language (SQL) for database querying and manipulation, including SELECT, INSERT, UPDATE, DELETE statements, and simple SQL queries.*

This paper provides practical knowledge of C Programming and SQL queries. List of laboratory programming assignments (not limited to these):

Lab on C Programming

1. Write a program to
   a) Produce ASCII equivalent of given number
   b) Find divisor or factorial of a given number
   c) Evaluate the following algebraic expressions after reading necessary values from the user (ax+b)/ (ax-b) -2.5 log x-cos 30+|x2-y2|+sqrt (2xy) - (x5+10x4+8x3+4x+2)
   d) Find sum of a geometric series
   e) Cipher a string
   f) Check whether a given string follows English capitalization rules
   g) Find sum of the following series 1+ ½ + 1/3 +_____+1/20
   h) Search whether a given substring exist in an input string or not and then delete this string from input string

2. Write a recursive program for tower of Hanoi problem.
3. The Fibonacci sequence of numbers is 1, 1, 2, 3, 5, 8……. Based on the recurrence relation F(n)=F(n-1)+F(n-2) for n>2 Write a recursive program to print the first n Fibonacci number.
4. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
   a) Addition of two matrices
   b) Subtraction of two matrices
   c) Finding upper and lower triangular matrices
   d) Trace of a matrix
   e) Transpose of a matrix
   f) Check of matrix symmetry
   g) Product of two matrices.
5. Write a program that takes two operands and one operator from the user perform the operation and then print the answer
6. Write functions to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib) Also write the main program.
7. Write a menu driven program for searching an sorting with following options:-
   a) Searching: Linear searching and binary searching
   b) Sorting: Insertion sort and Selection sort
8. Write a program to copy one file to other, use command line arguments.
9. Write a program to mask some bit of a number (using bit operations)
10. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

Lab on DBMS

1. Implementation of DDL commands of SQL with suitable examples a) Create table b) Alter table c) Drop Table.
2. Implementation of DML commands of SQL with suitable examples a) Select b) Insert c) Update d) Delete.
3. Implementation of different types of function with suitable examples a) Number function b) Aggregate Function c) Character Function d) Conversion Function e) Date Function.
4. Implementation of different types of operators in SQL a) Arithmetic Operators b) Logical Operators c) Comparison Operator d) Special Operator e) Set Operation.
5. Implementation of different types of Joins a) Inner Join b) Outer Join c) Natural Join etc.
6. Study and Implementation of a) Group By & having clause b) Order by clause c) Indexing.
7. Study & Implementation of a) Sub queries b) Views.
8. Study & Implementation of different types of constraints.
9. Study & Implementation of Database Backup & Recovery commands. Study & Implementation of Rollback, Commit, Savepoint.

10. Creating Database /Table Space a) Managing Users: Create User, Delete User b) Managing roles:-Grant, Revoke.

Course Learning Outcomes: *After successful completion of the course, the students will be able to:*

1. *Demonstrate proficiency in programming using the C language, including understanding of syntax, data types, control structures, functions, and pointers.*
2. *Utilize file handling techniques in C for reading from and writing to files, including text and binary files, and perform input/output operations effectively.*
3. *Understand memory management concepts in C, including dynamic memory allocation*
4. *Understand the basics of Structured Query Language (SQL) for database querying and manipulation, including SELECT, INSERT, UPDATE, DELETE statements, and simple SQL queries*