**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**
**(Formerly West Bengal University of Technology)**
**Syllabus of B. Sc. in IT**
**(Effective from 2023-24 Academic Sessions)**
**Semester: VI**
**Name of the Course:** Artificial Intelligence
**Course Code**: BSCITM601
**Credit**: 5
**Contact Hours**: 5L /Week
**Marks**: 100 (70 Theory + 30 Internal Assessment)

**Objective:**
- Understand foundational concepts, history, and scope of Artificial Intelligence.
- Learn AI problem-solving techniques, search strategies, and decision-making processes.
- Understand knowledge representation and reasoning mechanisms under certainty and uncertainty.
- Familiarize with AI applications in machine learning, natural language processing, expert systems, and robotics.
- Implement basic AI models using industry-relevant tools.
- Reflect on ethical issues, societal impact, and future directions of AI.

**Course Outcomes:**

| CO | Course Outcome Statement |
|---|---|
| **CO1** | Explain the foundations, history, and objectives of Artificial Intelligence. |
| **CO2** | Apply state-space search strategies and decision-making algorithms for AI problem-solving. |
| **CO3** | Represent knowledge using logic and reasoning methods, and manage uncertain information. |
| **CO4** | Analyze and explain various AI applications in learning systems, natural language, and robotics. |
| **CO5** | Use basic tools and languages to implement and evaluate AI models. |
| **CO6** | Discuss AI ethics, social impact, and current trends in AI research and development. |

| Module No. | Module Description | Mapped COs |
|---|---|---|
| I | Foundations of AI | CO1 |
| II | Problem-solving with Search | CO2 |
| III | Game Playing and Adversarial Search | CO2 |
| IV | Knowledge Representation | CO3 |
| V | Reasoning Under Uncertainty | CO3 |
| VI | Machine Learning and AI Applications | CO4, CO5 |
| VII | Tools, Ethics, and Future Trends | CO5, CO6 |

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**Contents:**
**Module I: Foundations of AI**

**Hours**: 10      **Marks:** 10
Definition and goals of Artificial Intelligence, History and evolution of AI, Foundations: logic, probability, cognitive science, AI domains: problem-solving, learning, perception, language, Intelligent agents: types, PEAS representation, environments, Turing Test and Chinese Room Argument, AI vs Human Intelligence

**Module II: Problem Solving through Search**

**Hours**: 12      **Marks:** 12
Problem formulation and state-space representation, Uninformed Search Strategies: Breadth-First, Depth-First, Depth-Limited, Iterative Deepening, Informed Search: Greedy Best-First, A*, Recursive Best-First Search, Heuristics: designing admissible and consistent heuristics, Local Search Algorithms: Hill Climbing, Simulated Annealing, Constraint Satisfaction Problems (CSPs): Backtracking, Forward Checking, Real-world AI search examples

**Module III: Game Playing and Adversarial Search**

**Hours**: 10      **Marks:** 8

Introduction to adversarial problems, Two-player zero-sum games, Minimax algorithm, Alpha-Beta pruning, Evaluation functions, Game tree complexity, Perfect-information and imperfect-information games, Deterministic and stochastic game settings, Basic idea of Expectimax for chance-based games. Application: chess, tic-tac-toe, etc.

**Module IV: Knowledge Representation and Reasoning**

**Hours**: 10 Hours      **Marks:** 10
Propositional logic: syntax, semantics, inference, Predicate logic: terms, functions, quantifiers, Semantic networks, Frames, Ontologies, Rule-based systems and production systems, Reasoning mechanisms: forward and backward chaining, Introduction to non-monotonic reasoning, Knowledge acquisition bottleneck

**Module V: Reasoning Under Uncertainty**

**Hours**: 10      **Marks:** 8
Limitations of logic-based reasoning, Probability theory recap, Bayesian Networks: structure, conditional probabilities, inference, Decision Theory: utility, expected value, Fuzzy Logic: membership functions, linguistic variables, fuzzy rules, Applications in diagnosis, risk assessment

**Module VI: Machine Learning and Intelligent Systems**

**Hours**: 14      **Marks:** 12

Introduction to Machine Learning: Supervised, Unsupervised, Reinforcement, Decision Trees, k-NN, and simple classification models, Introduction to Artificial Neural Networks and Deep Learning, Expert Systems: architecture, knowledge base, inference engine, Natural Language Processing: Tokenization, Morphological & Syntactic Analysis, Robotics: perception, motion planning, sensors, and actuators, AI in smart applications (IoT, healthcare, education, etc.)

**Module VII: AI Tools, Ethics, and Future Directions**

**Hours**: 10      **Marks:** 10
AI tools and languages: Prolog, Python (Numpy, scikit-learn, NLTK), Implementing simple AI models (demo or mini-projects), Bias and fairness in AI models, AI and Society: surveillance, job displacement, automation, Regulatory and ethical considerations, Current trends: Explainable AI, GPT, LLMs, AI in climate modeling

**List of Books-**
**Text book:**

| Sl. No. | Author(s) | Title | Edition / ISBN | Publisher |
|---|---|---|---|---|
| 1 | Stuart Russell & Peter Norvig | Artificial Intelligence: A Modern Approach | 4th Ed., ISBN: 9780134610993 | Pearson |
| 2 | Elaine Rich, Kevin Knight | Artificial Intelligence | 3rd Ed., ISBN: 9780070087705 | McGraw Hill |
| 3 | Nils J. Nilsson | The Quest for Artificial Intelligence | ISBN: 9780521122931 | Cambridge University Press |
| 4 | Tom M. Mitchell | Machine Learning | ISBN: 9781259096952 | McGraw Hill |

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**Syllabus of B. Sc. in IT**
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**Information and Cyber Security**
**Course Code: BSCITM602**
**Credit: 4**
**Total Marks: 100 (Internal: 30, End Semester: 70)**
**Contact Hours: 5L /Week**

**Course Objectives:**
- To introduce foundational and modern cyber security concepts, threats, and defense mechanisms
- To explore cryptographic principles used in digital security
- To analyze system, web, and network vulnerabilities and attacks
- To understand malware behavior, cloud/IoT risks, and forensic investigation
- To study Indian cyber laws, IT Act, and various cybercrimes

**Course Outcomes (COs)**

CO1: Understand core concepts of cyber security and digital risk.
CO2: Apply cryptographic mechanisms for data protection.
CO3: Analyze vulnerabilities in systems, networks, and web applications.
CO4: Explain authentication, firewalls, and intrusion detection techniques.
CO5: Recognize modern cyber-attacks and malware strategies.
CO6: Describe IT laws, cybercrime types, digital forensics, and incident handling

| Module No. | Module Title | Mapped CO |
|---|---|---|
| 1 | Introduction to Cyber Security | CO1 |
| 2 | Cryptography Fundamentals | CO2 |
| 3 | System and Network Vulnerabilities | CO3 |
| 4 | Web Application Vulnerabilities | CO3 |
| 5 | Authentication and Access Control | CO4 |
| 6 | Firewalls and Intrusion Detection | CO4 |
| 7 | Modern Cyber Attacks | CO5 |
| 8 | Malware and Threats | CO5 |
| 9 | Wireless, Cloud, and IoT Security | CO3 |
| 10 | Cyber Law, Cyber Crimes, and Digital Forensics | CO6 |

**Module 1: Introduction to Cyber Security**
**Hours: 10     Marks:** 10
Basics of cyber security, core principles of Confidentiality, Integrity, and Availability (CIA).
Explores the nature of information assets, threat actors, vulnerabilities, and risk assessment strategies. Different categories of attacks (active and passive) and understand threat modeling techniques like STRIDE.

**Module 2: Cryptography Fundamentals**
**Hours: 10      Marks:** 10
Fundamental cryptographic techniques, including symmetric key algorithms such as AES and DES, and asymmetric key systems like RSA. It also includes key exchange protocols like Diffie-Hellman, hash functions such as SHA-2 and HMAC, digital signatures, and the concept of Public Key Infrastructure (PKI). The use of cryptography in securing communication and data is emphasized.

**Module 3: System and Network Vulnerabilities**
**Hours: 8      Marks:** 8
Vulnerabilities in systems and networks. Port scanning, insecure configurations, weak credentials, and outdated software. Common attack techniques such as Denial of Service, Distributed Denial of Service, buffer overflow, ARP spoofing, and session hijacking are discussed with their impact and countermeasures.

**Module 4: Authentication and Access Control**
**Hours: 7      Marks:** 8
Explains authentication mechanisms and access control models. Password-based systems, hashing and salting, multi-factor authentication (MFA), biometrics, and session management. It also covers access control models such as Role-Based Access Control (RBAC), Discretionary Access Control (DAC), Mandatory Access Control (MAC), and protocols like Kerberos and OAuth.

**Module 5: Malware and Threats**
**Hours: 7      Marks:** 10
Various types of malwares including viruses, worms, trojans, ransomware, spyware, rootkits, and keyloggers. Malware propagation techniques, persistence mechanisms, obfuscation methods, and basic malware defense strategies.

**Module 6: Wireless, Cloud, and IoT Security**
**Hours: 8      Marks:** 12
Wireless, cloud, and IoT security challenges. Wi-Fi threats WEP/WPA2/WPA3, rogue access points, cloud vulnerabilities like insecure identity management and misconfigured storage, and IoT risks such as botnets and firmware exploitation.

**Module 7: Cyber Law, Cyber Crimes, and Digital Forensics**
**Hours: 10      Marks:** 12
Introduces cyber law, cyber-crimes, and digital forensics. Key sections of the Indian IT Act 2000, Sections 43, 66, 67, 69, types of cybercrimes such as identity theft, cyberbullying, financial fraud, and phishing, and an overview of the Digital Personal Data Protection Bill. Forensic investigation steps, digital evidence handling, chain of custody, and the NIST incident response lifecycle.

**Reference books:**

1. Hacking the Hacker, Roger Grimes, Wiley
2. Cyber Law By Bare Act, Govt Of india, It Act 2000
3. Information Security & Cyber Laws, Gupta & Gupta, Khanna Publishing House
4. Fundamentals of Information Systems Security, by David Kim and Michael G. Solomon, Jones & Bartlett Learning
5. Cybersecurity Essentials, by Charles J. Brooks, Christopher Grow, Philip A. Craig Jr., Donald Short, Sybex

**SUBJECT NAME:** Web Technology
**SUBJECT CODE:** BSCITM603

**MAXIMUM MARKS:** 100 (Theory: 70, Internal: 30) + 100 (Practical: 60 external + 40 internal)
**CREDIT:** 3 (Theory) + 2 (Practical)

**Contact Hours:  Theory-4 hrs /Week   Practical- 6 hrs/week**
# AIM:

1. To gain comprehensive knowledge of the Internet and its working.
2. Ability to use services offered by the Internet.
3. To enhance skills to develop websites using HTML, CSS, and JavaScript.

## OBJECTIVES:

1. To introduce the students to the network of networks – Internet.
2. To enable the students to use various services offered by the Internet.
3. To gain knowledge about the protocols used in various services of Internet.
4. To understand the working and applications of Intranet and Extranet.

## PRE-REQUISITE:

1. Understanding of basic programming logic.

## Course Outcomes (COs)

| CO No. | General Course Outcome |
|---|---|
| CO1 | Demonstrate an understanding of fundamental networking concepts, Internet architecture, and communication protocols. |
| CO2 | Use various Internet services and technologies effectively for communication and information exchange. |
| CO3 | Design and develop well-structured and user-friendly web pages using standard web development technologies. |
| CO4 | Develop dynamic and interactive web applications using server-side and client-side scripting languages. |

| CO5 | Apply essential security principles and techniques to protect data, networks, and web applications. |
| CO6 | Explore and analyze modern Internet technologies and multimedia applications used in today's digital environment. |

| Module No. | Module Description | Mapped COs |
|---|---|---|
| I | Introduction to Networking | CO1, CO2 |
| II | Web Programming | CO3 |
| III | Server Side Programming and Scripting | CO4 |
| IV | Security Issues | CO5 |
| V | Advanced Internet Technology | CO6 |

## DETAILED SYLLABUS:

**Module I – Introduction to Networking**
Overview of Networking, Intranet, Extranet, and Internet, domain and subdomain, address resolution, DNS, Telnet, FTP, HTTP, features of networking, segmentation, three-way handshaking, flow control, error control, congestion control, IP datagram, IPv4 and IPv6, classful and classless addressing, subnetting, NAT, IP masquerading, IPtables, intra- and inter-domain routing, unicast, multicast, and broadcast routing, and electronic mail.
**Hours:** 10     **Marks:** 12

**Module II – Web Programming**
Introduction to HTML, editors, elements, attributes, headings, paragraphs, formatting, links, tables, lists, block layout, CSS, forms, iframes, colors, image maps, attributes of image areas, Extensible Markup Language (XML), CGI scripts, and GET and POST methods.
**Hours:** 10     **Marks:** 15

**Module III – Server Side Programming and Scripting**
Basic PHP programming including variables, conditions, loops, arrays, data structures, hash, strings, regular expressions, file handling, and I/O handling. JavaScript basics such as statements, comments, variables, comparison, conditions, switch, loops, objects, arrays, Boolean, regular expressions, functions, error handling, validation, cookies creation and storage.
**Hours:** 12     **Marks:** 15

**Module IV – Security Issues**
Network security techniques, password and authentication, VPN, IP security, security in electronic transactions, Secure Socket Layer (SSL), Secure Shell (SSH), introduction to firewalls including packet filtering, stateful, application layer, and proxy-based firewalls.
**Hours:** 10     **Marks:** 13

**Module V – Advanced Internet Technology**
Internet telephony (VoIP), multimedia applications, multimedia over IP including RSVP, RTP,

RTCP, and RTSP, streaming media, codecs and plugins, IPTV, search engine optimization, and metadata.
**Hours:** 10    **Marks:** 15

# PRACTICAL

**Subject Name:** Web Technology Lab
**Subject  Code:** BSCITM691
**Credit:** 2
**Total  practical Class Hour- 60 Hrs**
**Practical Class - 6 hrs/week**

**Skills to be developed:**
**Intellectual skills:**

1. Ability to understand Web Design and Development.
2. Ability to analyze problems and provide program-based solutions.

**List of Practical:**
Based on theory syllabus, including the following experiments:

**Experiment 1 – HTML**
Create simple HTML documents with headings, paragraphs, line breaks, links, images, and tables. Apply CSS styles, forms, and attributes.

**Experiment 2 – PHP Basics**
Write PHP programs to print text, handle variables, loops, and basic operations.

**Experiment 3 – PHP Applications**
Create practical PHP programs such as a chessboard, electricity bill calculation, and conditional operations.

**Experiment 4 – PHP Functions and Control Structures**
Write calculator programs, calculate area, eligibility checks, and factorial using recursion.

**Experiment 5 – PHP Arrays**
Create and sort arrays in ascending and descending order, including associative arrays.

**Experiment 6 – PHP Advanced**
Implement regular expressions and form validations.

**Experiment 7 – PHP File and Cookie Handling**
Create, read, write files, and store/retrieve cookies.

**Practical Sessional Examination:**

- Internal Continuous Evaluation: 5 experiments (marks: 40)
- External Examination: On-spot experiment, lab note verification, viva voce (marks: 60)

## TEXT BOOKS:

| Author(s) | Title | Publisher |
|---|---|---|
| N.P. Gopalan & J. Akilandeswari | Web Technology: A Developer's Perspective | PHI Learning |
| Rahul Banerjee | Internetworking Technologies, An Engineering Perspective | PHI Learning |