MAHARAJA SUHEL DEV UNIVERSITY
AZAMGARH

BACHELOR OF ENGINEERING (B.E.) DEGREE PROGRAMME

(CHOICE BASED CREDIT SYSTEM)
COURSE STRUCTURE AND EVALUATION SCHEME

B.E. COMPUTER SCIENCE ENGINEERING
(4 YEARS UG PROGRAMME)

SYLLABI

for

B.E. 4TH Year

(CSE)

Effective from the Session: 2026-27

SEMESTER- VII														
S. No.	Code	Subject	Learning Mode	L	T	P	CT	TA	Total	PS	TE	PE	Total	Credit
1	BCS701	Artificial Intelligence	Offline	3	-	-	20	10	30	-	70	-	100	4
2	Departmental Elective-IV	Departmental Elective-IV	Offline	3	-	-	20	10	30	-	70	-	100	3
3	BOEM**	Open Elective-II	Offline/ MOOCs	3	0	0	20	10	30	-	70	-	100	3
4	BCS751	Artificial Intelligence LAB	Offline	0	0	2	-	-	-	50	-	50	100	2
5	BCS752	Mini Project or Internship Assessment*		0	0	4	-	-	-	100	-	-	100	2
6	BCS753	Project-I		0	0	10	-	-	-	150	-	-	150	6
7	BCS754	Startup and Entrepreneurial Activity Assessment		0	0	4	-	-	-	100	-	-	100	2
		Total		**9**	**0**	**20**							**750**	**22**
		*The Mini Project or internship (5-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.												

		SEMESTER- VIII												
S. No	Code	Subject	Learning Mode	Periods			Evaluation Scheme						Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BOEM**	Open Elective-III	MOOCs	3	0	0	15	10	25		75		100	4
2	BOEM**	Open Elective-IV	MOOCs	3	0	0	15	10	25		75		100	4
3	BCS851	Project-II		0	0	18				100		450	550	14
		Total		**6**	**0**	**18**							**750**	**22**

Departmental Elective- IV

1. BCS070 Internet of Things
2. BCS071 Cloud Computing
3. BCS072 Cryptography and Network Security
4. BCS073 Design & Development of Applications

B.E. (CSE)

SEVENTH SEMESTER (DETAILED SYLLABUS)

Artificial Intelligence (BCS701)

Unit 1: Introduction to Artificial Intelligence and Intelligent Agents

Definition, goals, and scope of Artificial Intelligence. Historical development and real-world applications of AI. Concept and characteristics of intelligent agents. Types of agents and environments. Agent architecture and design principles. Problem-solving approaches in AI, problem formulation, and problem-solving agents. Study of common AI problems and suitable solution approaches.

Unit 2: Problem Solving and Search Techniques

Introduction to state-space search and problem-solving methods. Uninformed search strategies: Breadth First Search (BFS), Depth First Search (DFS), and Iterative Deepening Search. Informed search strategies: Greedy Best-First Search and A* Search. Heuristics, optimization techniques, Hill Climbing, and Simulated Annealing. Constraint Satisfaction Problems (CSPs). Game playing techniques including Minimax algorithm, Alpha-Beta Pruning, stochastic games, and partially observable games.

Unit 3: Knowledge Representation and Reasoning

Knowledge representation using Propositional Logic and First-Order Logic. Syntax, semantics, and inference mechanisms. Knowledge-based agents and the Wumpus World problem. Logic programming using Prolog. Forward chaining, backward chaining, and resolution techniques. Introduction to ontological engineering and automated reasoning systems.

Unit 4: Uncertainty and Learning Techniques

Concepts of uncertainty and probabilistic reasoning in AI. Bayes' Rule and Bayesian Networks. Fuzzy logic and methods for handling imprecise information. Fundamentals of Neural Networks including Perceptron and introductory Backpropagation. Basics of Machine Learning in the AI context. Introduction to supervised and unsupervised learning techniques.

Unit 5: Applications of AI and Multi-Agent Systems

Applications of Artificial Intelligence in Natural Language Processing, Machine Translation, Information Retrieval and Extraction, Robotics, Speech Recognition, and intelligent software agents. Concepts of perception, planning, and motion in robotics. Multi-agent systems: architecture, communication, trust, negotiation, and reputation mechanisms. Explainable AI (XAI): importance of interpretability, methods for explaining black-box models, trust in AI systems, and case studies in NLP and computer vision.

Recommended Textbooks

- Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2022
- Ivan Bratko, Prolog: Programming for Artificial Intelligence, 4th Edition, Addison-Wesley
- Nils J. Nilsson, The Quest for Artificial Intelligence, Cambridge University Press
- David Poole & Alan Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge Press

Internet of Things (BCS070)

Unit 1: Introduction to Internet of Things (IoT)

Overview, vision, definition, and conceptual framework of the Internet of Things (IoT). Architectural view and enabling technologies behind IoT. Sources and characteristics of IoT systems. Machine-to-Machine (M2M) communication and practical examples of IoT applications. Design principles for connected devices including IoT/M2M system layers, design standardization, communication technologies, data enrichment, data consolidation, ease of design, and affordability considerations.

Unit 2: Hardware and Embedded Platforms for IoT

Introduction to IoT hardware components including sensors, digital sensors, actuators, RFID technology, wireless sensor networks, and participatory sensing technologies. Basics of embedded computing systems. Study of IoT-supported hardware platforms such as Arduino, NetArduino, Raspberry Pi, BeagleBone, Intel Galileo boards, and ARM Cortex-based systems.

Unit 3: Network and Communication Aspects in IoT

Wireless communication challenges in IoT environments. Medium Access Control (MAC) issues and survey of MAC protocols. Routing protocols for sensor networks. Concepts of sensor deployment, node discovery, data aggregation, and data dissemination in IoT networks.

Unit 4: Programming the Arduino for IoT

Introduction to Arduino platform boards and board anatomy. Arduino IDE setup and programming basics. Writing and executing code using emulators and libraries. Extensions and add-ons in Arduino systems. Programming Arduino boards for IoT-based applications and device communication.

Unit 5: IoT Design Challenges and Applications

Design and development challenges in IoT systems. Security and privacy challenges in IoT applications. Applications of IoT in smart metering, e-healthcare, city automation, automotive systems, home automation, smart cards, and communication with hardware devices, mobiles, and tablets. Design and implementation concepts of smart street lighting systems in smart cities.

Recommended Textbooks

- Olivier Hersent,David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", wiley
- Jeeva Jose, Internet of Things, Khanna Publishing House
- Michael Miller "The Internet of Things" by Pearson
- Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
- ArshdeepBahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
- 6. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India

Cloud Computing (BCS071)

Unit 1: Introduction to Cloud Computing

Introduction to Cloud Computing, definition and evolution of cloud technologies. Fundamental principles of parallel and distributed computing. Characteristics of cloud computing including scalability, elasticity, and on-demand provisioning. Benefits and applications of cloud-based systems.

Unit 2: Cloud Enabling Technologies and Virtualization

Service-Oriented Architecture (SOA), REST-based services, and Systems of Systems. Web services and Publish–Subscribe communication model. Fundamentals of virtualization, types of virtualization, and implementation levels. Virtualization structures, tools, and mechanisms. Virtualization of CPU, memory, and I/O devices. Virtualization support, fault tolerance, and disaster recovery mechanisms.

Unit 3: Cloud Architecture, Services, and Storage

Layered cloud architecture design and NIST Cloud Computing Reference Architecture. Deployment models including Public Cloud, Private Cloud, and Hybrid Cloud. Service models such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Architectural design challenges in cloud environments. Cloud storage concepts, Storage-as-a-Service, advantages of cloud storage, major cloud storage providers, and Amazon S3.

Unit 4: Resource Management and Security in Cloud

Resource management in inter-cloud environments. Resource provisioning techniques and methods. Global exchange and sharing of cloud resources. Security issues in cloud computing including cloud security challenges, SaaS security, security governance, and virtual machine security. Identity and Access Management (IAM) and cloud security standards.

Unit 5: Cloud Technologies and Emerging Advancements

Introduction to Hadoop and MapReduce framework. VirtualBox and virtualization environments. Google App Engine and its programming environment. OpenStack cloud platform. Federation in cloud computing, levels of federation, federated services, and federated applications. Future trends and advancements in cloud federation technologies.

Recommended Textbooks

1. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things – Morgan Kaufmann Publishers, 2012
2. Cloud Computing: Implementation, Management and Security – CRC Press, 2017
3. Mastering Cloud Computing – Tata McGraw Hill, 2013
4. Cloud Computing: A Practical Approach – Tata McGraw Hill, 2009
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud – O'Reilly, 2009

Cryptography & Network Security (BCS072)

Unit 1: Introduction to Cryptography and Classical Encryption Techniques

Overview of security attacks, security services, and security mechanisms. Classical encryption techniques including substitution ciphers and transposition ciphers. Concepts of cryptanalysis and steganography. Introduction to stream ciphers and block ciphers. Principles of modern block ciphers, Shannon's concepts of confusion and diffusion, Feistel structure, Data Encryption Standard (DES), strength of DES, differential cryptanalysis, block cipher modes of operation, and Triple DES.

Unit 2: Mathematical Foundations and Public Key Cryptography

Introduction to groups, fields, and finite fields of the form GF(p). Modular arithmetic, prime and relatively prime numbers, and the Extended Euclidean Algorithm. Advanced Encryption Standard (AES) encryption and decryption. Fermat's Theorem, Euler's Theorem, primality testing, Chinese Remainder Theorem, and Discrete Logarithmic Problem. Principles of public key cryptosystems, RSA algorithm, and security aspects of RSA.

Unit 3: Message Authentication and Digital Signatures

Authentication requirements and authentication functions. Message Authentication Codes (MACs), hash functions, birthday attacks, and security of hash functions. Secure Hash Algorithm (SHA). Digital signatures and their applications. ElGamal Digital Signature Technique, Digital Signature Standard (DSS), and proof and verification of digital signature algorithms.

Unit 4: Key Management and Authentication Applications

Symmetric and public key distribution techniques. Diffie–Hellman Key Exchange protocol. X.509 certificates and Public Key Infrastructure (PKI). Authentication applications including Kerberos. Electronic mail security using Pretty Good Privacy (PGP) and S/MIME.

Unit 5: Network and System Security

IP Security architecture including Authentication Header (AH), Encapsulating Security Payload (ESP), combining security associations, and key management. Introduction to Secure Socket Layer (SSL) and Secure Electronic Transaction (SET). System security concepts including intrusion, intrusion detection systems, computer viruses and related threats, and firewalls.

Recommended Textbooks

- Cryptography and Network Security: Principles and Practice – Pearson Education
- Cryptography and Network Security – McGraw Hill
- Cryptography and Network Security – Wiley
- Applied Cryptography – John Wiley & Sons
- Network Security and Cryptography – Cengage Learning
- Cryptography and Network Security – McGraw Hill

Design & Development of Applications (BCS073)

Unit 1: Introduction to Mobile Applications

Introduction to mobile applications and embedded systems. Market trends and business drivers for mobile applications. Publishing, deployment, and delivery mechanisms for mobile applications. Techniques for requirements gathering, analysis, and validation in mobile application development.

Unit 2: Basic Design of Mobile Applications

Fundamentals of embedded systems design and embedded operating systems. Hardware and software design constraints in mobile applications. Mobile application architecture and design principles. User interface design for mobile applications including touch events and gesture handling. Quality attributes in mobile applications such as performance, usability, security, availability, and maintainability.

Unit 3: Advanced Mobile Application Design

Designing mobile applications with multimedia support and web access capabilities. Integration of mobile applications with GPS services and social networking platforms. Accessing cloud-hosted applications and services. Design patterns and best practices for developing scalable and efficient mobile applications.

Unit 4: Android Application Development

Introduction to Android development environment and Android architecture. Activities, views, and user interface interaction. Data persistence using SQLite database. Application packaging and deployment process. Interaction with server-side applications. Using Google Maps, GPS, and Wi-Fi services in Android applications. Integration with social media applications.

Unit 5: iOS Application Development and Swift

Introduction to Objective-C and features of the iOS platform. User interface implementation and touch frameworks in iOS. Data persistence using Core Data and SQLite. Developing location-aware applications using Core Location and MapKit. Integration of calendar, address book, Wi-Fi, and social media applications. Introduction to iPhone marketplace and app publishing. Basics and features of the Swift programming language.

Recommended Textbooks

- Android in Practice – DreamTech, 2012
- Composing Mobile Apps: Learn, Explore, Apply
- Beginning Objective-C – Apress, 2012
- Professional Mobile Application Development – Wrox, 2012
- Beginning iOS Development: Exploring the iOS SDK – Apress, 2013

BCS751	ARTIFICIAL INTELLIGENCE LAB

DETAILED SYLLABUS

1. **Implement Breadth First Search (BFS)** for a given graph or maze.
2. **Implement Depth First Search (DFS)** for a tree or graph structure.
3. **Solve the 8-Puzzle Problem** using A* Search Algorithm.
4. **Implement Hill Climbing Algorithm** for numerical optimization or pathfinding.
5. **Implement Simulated Annealing Algorithm** for constraint-based search problems.
6. **Solve Water Jug Problem** using state-space search (BFS or DFS).
7. **Write Prolog programs** to define family relationships using predicates.
8. **Implement 4-Queens Problem** in Prolog using backtracking.
9. **Implement Unification Algorithm** in Python or Prolog.
10. **Implement Forward and Backward Chaining** in a rule-based system (manual or code-based).
11. **Demonstrate Resolution in Propositional Logic** through a basic example (e.g., proving a theorem).
12. **Remove punctuation and stop words** from a paragraph using nltk.
13. **Perform stemming and lemmatization** on user-input text.
14. **Apply POS (Part of Speech) tagging** using NLTK on a given sentence.
15. **Build a simple text classifier** using NLTK (e.g., classify messages as spam/ham).
16. **Implement Tic-Tac-Toe game** with a basic AI opponent.
17. **Implement Min-Max (Minimax) Algorithm** for decision making in turn-based games.
18. **Enhance the game with Alpha-Beta Pruning** to optimize Min-Max.
19. **Simulate a Vacuum Cleaner Agent** that intelligently cleans a 2D environment.
20. **Build a simple chatbot** using rules or pre-trained logic (can use regex or basic intent matching).
21. **Design a Constraint Satisfaction Problem solver**, e.g., Sudoku, or Map Coloring.
22. **Perform simple Bayesian reasoning** for a probability-based decision problem (e.g., medical diagnosis).

Instructions to the Instructor:

1. The instructor may **add/delete/modify/tune** experiments depending on syllabus coverage and availability of tools.
2. All experiments should preferably be implemented using **Python (with NLTK and standard libraries)** and **SWI-Prolog** for logic programming tasks.