

Centre for Artificial Intelligence
Islamic University of Science & Technology
BS-FYUGP through DYOD
Major in Artificial Intelligence

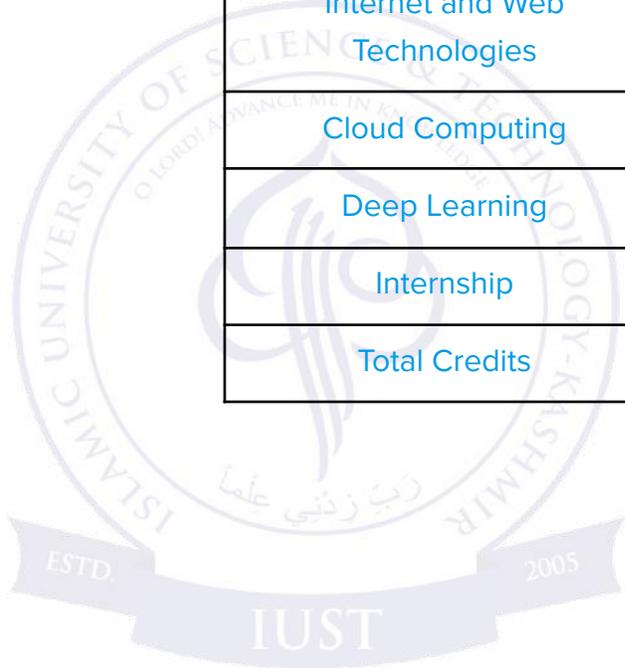


Curriculum
for
Undergraduate Programme
4 Years (FYUGP)
Semester V
2025 Onwards



Semester V – Course Structure (BS-FYUGP DYOD)

Course Title	Code	L	T	P	S	Credits
Data Structures	CAI-DYOD-301C	3	1	2	0	5
Database Management Systems Design	CAI-DYOD-302C	3	0	2	0	4
Internet and Web Technologies	CAI-DYOD-303C	3	0	2	1	5
Cloud Computing	CAI-DYOD-304C	3	0	0	0	3
Deep Learning	CAI-DYOD-305C	3	0	2	0	4
Internship	CAI-DYOD-306P	0	0	0	2	2
Total Credits						23





Data Structures

Semester V

Course Code
CAI-DYOD-301C
5 Credits

L	T	P	S
3	1	2	0

Course Outcomes

- ✓ Introduce fundamental concepts and types of data structures and their operations.
- ✓ Develop understanding of arrays, linked lists, stacks, queues, and trees.
- ✓ Demonstrate implementation of data structures using C / Python.
- ✓ Analyze appropriate data structures for given problems.
- ✓ Apply knowledge of data structures in simple AI or data-driven contexts.

Course Content

UNIT I

Introduction to data structures: meaning, need, and types. Basic concepts – data types, abstract data types, and dynamic memory allocation. Overview of arrays and strings; operations like insertion, deletion, traversal, and searching.

(8 hours)

UNIT II

Linked lists: singly, doubly, and circular linked lists. Representation, creation, and basic operations. Stacks: concept, implementation using arrays and linked lists, operations (push, pop, peek), and applications such as expression conversion.

(10 hours)

UNIT III

Queues: concept, implementation using arrays and linked lists, circular queue, priority queue, and applications. Trees: terminology, binary trees, tree traversals (inorder, preorder, postorder), and applications.

(12 hours)

UNIT IV

Introduction to graphs: representation (adjacency list/matrix) and basic traversals (BFS, DFS). Basic file handling and its use with data structures. Mini projects integrating two or more data structures for problem-solving.

(10 hours)



Text Books

1. R. Thareja, *Data Structures Using C*, 2nd ed. New Delhi, India: Oxford University Press, 2019.
2. S. Lipschutz, *Data Structures (Schaum's Outline Series)*, New Delhi, India: McGraw Hill Education, 2014.
3. E. Balagurusamy, *Data Structures Using C*, New Delhi, India: McGraw Hill Education, 2013.

Reference Books

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, *Data Structures and Algorithms*, Reading, MA: Addison-Wesley, 1983.
2. E. Horowitz and S. Sahni, *Fundamentals of Data Structures in C*, Hyderabad, India: Universities Press, 2008.
3. Y. D. Liang, *Introduction to Python Programming and Data Structures*, New York, NY: McGraw Hill, 2020.
4. Y. Langsam, M. J. Augenstein, and A. M. Tenenbaum, *Data Structures Using C and C++*, 2nd ed. Upper Saddle River, NJ: Prentice Hall, 1996.





Database Management System Design

Semester V

Course Code
CAI-DYOD-302C

4 Credits

L	T	P	S
3	0	2	0

Course Outcomes

- ✓ Explain the purpose, characteristics, and architecture of database systems.
- ✓ Design ER models and relational schemas for real-world applications.
- ✓ Apply SQL for data definition, manipulation, and control.
- ✓ Understand normalization, transaction management, and concurrency.
- ✓ Use databases practically for AI-related data handling and analytics.

Course Content

UNIT I

Introduction to databases: data, information, and database concepts.
 Advantages of DBMS over file systems, three-level architecture,
 Data models, and DBMS components.

(8 hours)

UNIT II

Entity–Relationship model: entities, attributes, relationships, ER diagrams, and conversion to relational model.
 Relational algebra and basic operations.

(10 hours)

UNIT III

SQL: data definition, manipulation, constraints, and joins. Subqueries, views, and aggregate functions.
 Introduction to PL/SQL – procedures, triggers, and cursors.

(12 hours)

UNIT IV

Normalization: 1NF to BCNF, anomalies and dependencies.
 Transactions, concurrency control, and recovery.
 Overview of NoSQL databases and applications in AI data storage.

(10 hours)



Text Books

1. A. Silberschatz, H. F. Korth, and S. Sudarshan, Database System Concepts, 7th ed. New Delhi, India: McGraw Hill Education, 2019.
2. R. Elmasri and S. B. Navathe, Fundamentals of Database Systems, 7th ed. Noida, India: Pearson Education, 2016.

Reference Books

1. C. J. Date, An Introduction to Database Systems, 8th ed., Noida, India: Pearson Education, 2004.
2. R. Ramakrishnan & J. Gehrke, Database Management Systems, 3rd ed., New York, NY: McGraw Hill, 2003.
3. C. Zaniolo, S. Ceri, C. Faloutsos, R. T. Snodgrass & V. S. Subrahmanian, Advanced Database Systems, San Francisco, CA: Morgan Kaufmann, 1997.
4. S. Wagner Dietrich & S. Urban, An Advanced Course in Database Systems: Beyond Relational Databases, Upper Saddle River, NJ: Prentice Hall, 2005.





Internet and Web Technologies

Semester V

Course Code
CAI-DYOD-303C

5 Credits

L	T	P	S
3	0	2	1

Course Outcomes

- ✓ Explain the architecture and working of the Internet and World Wide Web.
- ✓ Develop client-side and server-side web applications.
- ✓ Demonstrate use of HTML, CSS, JavaScript, and web frameworks.
- ✓ Implement dynamic and database-connected websites.
- ✓ Apply web development for societal or AI-based mini projects.

Course Content

UNIT I

Overview of Internet and WWW: history, protocols (HTTP, FTP, SMTP), domain name system, IP addressing, and web servers.

Introduction to web browsers and web standards.

(8 hours)

UNIT II

HTML5 and CSS3: structure of HTML documents, forms, multimedia elements, tables, and responsive design using CSS.

(10 hours)

UNIT III

Client-side scripting using JavaScript: variables, functions, DOM manipulation, event handling, and form validation. Introduction to AJAX and JSON.

(10 hours)

UNIT IV

Server-side scripting using Python (Flask/Django) or PHP: server configuration, dynamic pages, database connectivity, and deployment basics.

Mini project – design a small web app for social purpose.

(12 hours)

Text Books

1. A. S. Godbole and A. Kahate, Web Technologies: TCP/IP to Internet Application Architectures, 5th ed., New Delhi, India: McGraw Hill Education, 2021.
2. H. M. Deitel, P. J. Deitel, and A. Deitel, Internet and World Wide Web: How to Program, 5th ed., Noida, India: Pearson Education, 2018.



Reference Books

1. R. Nixon, Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites, 5th ed., Sebastopol, CA: O'Reilly Media, 2021.
2. I. Bayross, Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, 6th ed., Mumbai, India: BPB Publications, 2020.
3. C. Xavier, Web Technology and Design, New Delhi, India: New Age International Publishers, 2013.
4. R. Kamall, Internet and Web Technologies, New Delhi, India: Tata McGraw Hill, 2007.
5. J. Duckett, HTML and CSS: Design and Build Websites, Indianapolis, IN: Wiley, 2011.





Cloud Computing

Semester V

Course Code
CAI-DYOD-304C

3 Credits

L	T	P	S
3	0	0	0

Course Outcomes

- ✓ Explain fundamental concepts and architecture of cloud computing.
- ✓ Distinguish service and deployment models (IaaS, PaaS, SaaS).
- ✓ Understand virtualization, resource provisioning, and scalability.
- ✓ Explore cloud storage and computing services (AWS, Azure, GCP).
- ✓ Demonstrate cloud deployment of simple AI or web applications

Course Content

UNIT I

Introduction to cloud computing: characteristics, evolution, and benefits. Cloud architecture, layers, and reference models.

(8 hours)

UNIT II

Service models: IaaS, PaaS, SaaS – concepts, examples, and use cases. Deployment models: public, private, hybrid, and community clouds.

(10 hours)

UNIT III

Virtualization: types, hypervisors, and virtual machine management. Resource allocation, scalability, and load balancing in clouds.

(10 hours)

UNIT IV

Cloud storage systems, APIs, and security challenges. Cloud services for AI/ML applications. Practical sessions using Google Colab / AWS Educate / Azure AI.

(12 hours)

Text Books

1. R. Buyya, C. Vecchiola, and S. T. Selvi, Mastering Cloud Computing: Foundations and Applications Programming, New Delhi, India: McGraw Hill Education, 2013.
2. T. Erl, Cloud Computing: Concepts, Technology & Architecture, Noida, India: Pearson Education, 2019.

Reference Books

1. A. T. Velte, T. J. Velte, and R. Elsenpeter, *Cloud Computing: A Practical Approach*, New Delhi, India: McGraw Hill Education, 2010.
2. T. J. Velte and R. Elsenpeter, *Cloud Computing Basics*, Noida, India: Pearson Education, 2022.
3. N. B. Ruparelia, *Cloud Computing, Revised and Updated Edition*, New York, NY: Oxford University Press, 2023.
4. D. E. Comer, *The Cloud Computing Book: The Future of Computing Explained*, Boca Raton, FL: CRC Press (Taylor & Francis Group), 2021.
5. G. Shyam and S. K. Manvi, *Cloud Computing: Concepts and Technologies*, 1st ed., London, UK: CRC Press (Taylor & Francis Group), 2021





Deep Learning Essentials

Semester V

Course Code
CAI-DYOD-305C

4 Credits

L	T	P	S
3	0	2	0

Course Outcomes

- ✓ Understand the core concepts and architectures of deep neural networks.
- ✓ Implement feedforward, convolutional, and recurrent neural networks using modern frameworks.
- ✓ Apply deep learning methods for classification, detection, and generation tasks.
- ✓ Evaluate models with appropriate metrics and optimization techniques.
- ✓ Demonstrate understanding of ethical considerations and limitations of deep learning systems.

Course Content

UNIT I

Introduction to Deep Learning – evolution from machine learning; perceptron model; gradient descent; backpropagation algorithm; activation functions; overfitting and regularization.

(8 hours)

UNIT II

Deep Feedforward Networks and Convolutional Neural Networks (CNNs); architectures like LeNet, AlexNet, VGG, ResNet; transfer learning; feature extraction..

(10hours)

UNIT III

Recurrent Neural Networks (RNNs), LSTM, GRU; sequence learning; applications in text and speech. Introduction to attention mechanisms and transformers.

(10 hours)

UNIT IV

Autoencoders and generative models (VAE, GANs). Model deployment, optimization, and interpretability. Ethical issues in AI systems.

(12 hours)



Text Books

1. I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning, Cambridge, MA: MIT Press, 2016.
2. F. Chollet, Deep Learning with Python, 2nd ed., Shelter Island, NY: Manning Publications, 2021.

Reference Books

1. J. Howard and S. Gugger, Deep Learning for Coders with fastai and PyTorch, Sebastopol, CA: O'Reilly Media, 2020.
2. A. Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd ed., Sebastopol, CA: O'Reilly Media, 2022.
3. [5] M. A. Nielsen, Neural Networks and Deep Learning, San Francisco, CA: Determination Press, 2015.
4. [6] A. Zhang, Z. C. Lipton, M. Li, and A. J. Smola, Dive into Deep Learning, Cambridge, U.K.: Cambridge University Press, 2023.





Internship

Semester V

Course Code
CAI-DYOD-301P

2 Credits

L	T	P	S
0	0	0	2

Course Outcomes

- ✓ Apply theoretical knowledge to real-world AI and data-driven problems.
- ✓ Gain exposure to industrial, academic, or research-oriented work environments.
- ✓ Develop teamwork, reporting, and communication skills.
- ✓ Understand ethical and societal aspects of technology application.

Course Content

UNIT I

Students shall undertake a short-term internship, project, or community-based AI application under supervision. Work may include:

- Development of mini-projects using AI/ML tools.
- Deployment of web, data, or cloud applications.
- Industry or research lab internships.
- Societal engagement projects using technology for local problem-solving.

Each student must submit:

1. Internship Report summarizing objectives, methodology, and outcomes.
2. Presentation/Viva-voce at the end of the semester.

Assessment will be based on internal evaluation by faculty supervisor and external evaluation by department committee.



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