



KANNUR UNIVERSITY
കണ്ണൂർ സർവകലാശാല

(Abstract)

The Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University and the Syllabi of three Certificate programmes offered by the Department of Information Technology, namely : 1. Cyber Security 2.Data Science and AI 3.IoT Technologies – Approved and Implemented w.e.f 2025 admission– Erratum Issued

ACADEMIC C SECTION

ACAD/ACAD C3/26853/2025

Dated: 23.03.2026

Read:-1. U.O of even number dated 09.03.2026

ORDER

- 1.In the University Order No. ACAD/ACADC3/26853/2025 dated 09.03.2026, implementing the Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University and the syllabi of the three Certificate Programmes offered by the Department of Information Technology, the year of implementation mentioned in the Abstract was "**Approved and implemented w.e.f 2026 admission**"
- 2.The above three Certificate Programmes were ordered to be implemented from 2025 Admission, by the Vice chancellor.
- 3.Hence the sentence shall be corrected and read as "**Approved and implemented w.e.f 2025 admission**".
- 4.Erratum is issued accordingly.

Sd/-

Bindu K P G

DEPUTY REGISTRAR (ACADEMIC)

For REGISTRAR

- To:
1. The HoD, Department of IT, Kannur University
 2. The Controller of Examination(Through PA to CE)
 3. Director, DoA

- Copy To:
- 1.Computer Programmer
 - 2.PS to VC/ PA to R
 - 3.DR/AR (Acad)
 - 4.EXCI
 - 5.IT Cell(for uploading on the website)
 - 6.JR II Exam
 - SF/DF/FC



Forwarded / By Order

[Signature]
SECTION OFFICER





KANNUR UNIVERSITY
കണ്ണൂർ സർവകലാശാല

(Abstract)

The Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University and the Syllabi of three Certificate programmes offered by the Department of Information Technology, namely : 1. Cyber Security 2.Data Science and AI 3.IoT Technologies – Approved and Implemented w.e.f 2026 admission – Orders Issued

ACADEMIC C SECTION

ACAD/ACAD C3/26853/2025

Dated: 09.03.2026

- Read:-1.Email dated 15.12.2025 from HoD , Department of IT, Kannur University
2.Email dated 15.12.2025 from Dean, Faculty of Technology
3.Minutes of the Meeting of the Standing Committee of the Academic Council, held on 21.02.2026.
4.Orders of the Vice Chancellor in the file of even number , dated 09.03.2026

ORDER

1.As per paper read (1), the Head, Department of Information Technology, Kannur University has submitted the Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University, along with the Syllabi of the following Certificate Programmes offered by the Department of Information Technology :

- a. Cyber Security
- b. Data Science and AI
- c. IoT Technologies.

2.The Regulation and Syllabi of the above Certificate Programmes were forwarded to the Dean as per the order of Vice Chancellor and the Dean vide paper read (2) above remarked to proceed as per the University rules and regulations.

3. Considering the matter, the Vice Chancellor has ordered to place the regulation for the Certificate Programmes and Syllabi of the three Certificate Programmes offered by the Department of Information Technology before the Standing Committee of the Academic Council for consideration .

4. The Standing Committee of the Academic Council, held on 21.02.2026, considered the Regulations for the Certificate programmes and the Syllabi of the three Certificate Programmes offered by the Department of Information Technology and vide paper read (3) above, recommended to approve the same.

5.The Vice Chancellor after considering the recommendation of the Standing Committee of the Academic Council and in exercise of the powers of the Academic Council conferred under Section 11(1) Chapter III of the Kannur University Act, 1996 and all other enabling provisions read together

with has approved the Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University and the Syllabi of the three Certificate Programmes offered by the Department of Information Technology mentioned at para 1 above and accorded sanction to implement the same w.e.f.2025 admission.



6.The Regulations for the Certificate Programmes conducted by the Teaching Departments/Schools of Kannur University and the Syllabi of the three Certificate Programmes offered by the Department of Information Technology are appended with this U.O. and uploaded on the University website.

7.Orders are issued accordingly.

Sd/-

Bindu K P G


DEPUTY REGISTRAR (ACADEMIC)

For REGISTRAR

To: 1. The HoD, Department of IT, Kannur University
2. The Controller of Examination(Through PA to CE)
3 . Director, DoA

Copy To: 1.Computer Programmer
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SECTION OFFICER



8. PASS REQUIREMENTS

A minimum CGPA of 4.0 is required for successful completion of the Certificate Programme.

9. ATTENDANCE

A minimum of 60% attendance is mandatory to appear for the End Programme examination. Condonation of attendance shall be governed by university norms.

10. CERTIFICATION

Students who successfully complete the programme shall be awarded a Certificate by Kannur University.

The Certificate shall mention:

- Name of the Programme
- Duration
- Credits Earned
- GPA

11. DEPARTMENT COUNCIL

The Department Council shall be responsible for:

- Designing the curriculum
- Conduct of admission tests
- Teaching, evaluation, and examination including the question paper setting of all examination including the Terminal examinations.
- Monitoring academic standards

12. TRANSITORY PROVISION

The Vice-Chancellor shall have the power to resolve any difficulty in implementing these Regulations.



Module 4: Introduction to Data Handling & Mini Project

Introduction to Scientific Python Ecosystem: NumPy, pandas, matplotlib, seaborn, Handling missing values, filtering, grouping, aggregation, Data Cleaning & Preparation: Handling duplicates, missing values, outliers (basic), Type conversion, Data Visualization, Problem definition, data collection, cleaning, modeling, evaluation, Writing clean, modular code and documentation

Core Compulsory Readings

1. VanderPlas, J. (2016). *Python Data Science Handbook*. O'Reilly Media.
2. Martin C. Brown. (2018). *Python: The Complete Reference*. McGraw-Hill Education.
3. Mukku, L., Thomas, J., & Jingle, D. J. (2023). *Quantum Computing with Python: From Theory to Implementation*. CRC Press.

TEACHING LEARNING STRATEGIES

- Lecturing, case study/mini projects, Team Learning, presenting seminars on selected topics, Digital Learning

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %





- To impart hands-on training in ethical hacking, network security, operating system security, and web security.
- To develop practical skills in identifying, analysing, and mitigating cyber security vulnerabilities.
- To familiarize learners with contemporary cyber security tools, techniques, and industry best practices.
- To introduce AI and machine-learning-based techniques for intelligent threat detection and security analysis.
- To prepare students for real-world cyber security challenges through industry-oriented and practical learning.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Understand and explain fundamental concepts, principles, and challenges in cyber security.
CO2	Identify and analyse cyber threats, vulnerabilities, and risks across networks, operating systems, and web applications.
CO3	Apply ethical hacking techniques and security testing methodologies to assess system security.
CO4	Use modern cyber security tools and AI-based techniques for threat detection, analysis, and incident response.
CO5	Address real-world cyber security problems using practical, industry-relevant approaches.

COURSE CONTENTS

Module 1: Foundation of Network Security & Cryptography

Basic concepts of Computer Network - Topology, Transmission mode, Categories of networks, Transmission medias, Ethernet and Basics of wireless network – ARP - MAC Address-IP Addressing (IPV4-IPV6)- Subnetting, Basic Network Devices: Switch-Router, Defence in Depth Approach-Perimeter Security, Basics of Cryptography:

Encryption- Decryption-Symmetric Key (DES, AES), Asymmetric Key- (RSA, ECC) - Hashing-Public Key Infrastructure (PKI), Digital Signature- Digital certificate-SSL-TLS.

Module 2: Introduction to Cyber Security & Ethical Hacking

Introduction to Cyber security: CIA Triad-Vulnerability -Threat – risk - Security Attacks – Malwares -phishing- ransomware-botnet- Steganography -Intrusion-Hacking. Introduction to Ethical Hacking- Types of Hackers Classes- Cyber Kill chain – Reconnaissance: Foot-printing –Google hacks - Foot printing through Web Services-Foot printing through Social Networking Sites -Website Foot Printing-Email Foot Printing-Who is Foot Printing-Open-source Intelligence (OSINT Frame work).

Module 3: Vulnerability Assessment & Exploitation

Scanning: Different scan techniques-Port scan, Host Discovery - OS Discovery (Banner Grabbing/OS Fingerprinting) - Network scan - Wireless Concepts -Wireless Hacking - Wireless Encryption -Wireless Threats-Wireless-Vulnerability Scan-Vulnerability Analysis-Common vulnerability exposures (CVE), Man In The Middle attack techniques(MITM)- ARP Spoofing-DNS Spoofing-Password Cracking and counter measures- Email Hacking and counter measures- Command and Control-Privilege Escalation-Post Exploitation.

Module 4: Machine Learning in Cyber Security

Dataset pre-processing and Feature engineering, Dimensionality reduction (PCA), Supervised Learning, Unsupervised Learning, Semi Supervised Learning, Regression Models and Classification Models, Ensemble learning (Bagging, Boosting, Random Forest, Gradient Boosting), Regularization techniques (L1, L2, Dropout), Bias–variance trade off and overfitting control, Model evaluation & performance metrics.

Core Compulsory Readings

1. Introduction to computer network by Sanjay sharma.
2. Fundamentals of computer networks by Chandra Mohan.
3. Cryptography and Network Security by William Stallings.
4. Cryptography and network security by Marcelo Sampaio de Alencar.
5. Introduction to Cyber Security concepts principles technologies and practices by Ajay Singh.
6. Cyber Security Fundamentals by Rajesh Kumar Goutam.



7. Vulnerability Analysis and Defense for the Internet by Singh A.

TEACHING LEARNING STRATEGIES

- Lecturing, case study/mini projects, Team Learning, presenting seminars on selected topics, Digital Learning

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1.	Attendance	5%
2.	Q Factor (Class room engagement, Response in the class	5%
3.	Quizzes (5 quizzes)	10%
4.	Graded Assignment (4)	20 %
5.	Case study / Course project	20%
6.	Mid term exam	10 %
7.	Terminal Exam	30 %



- To familiarize students with security mechanisms for web, operating systems, and mobile platforms.
- To impart practical exposure to security assessment tools and techniques used in real-world environments.
- To enhance awareness of emerging threats and defense strategies in modern computing systems.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Explain operating system security architectures and apply OS hardening and access control mechanisms.
CO2	Identify and mitigate common web application vulnerabilities based on OWASP standards.
CO3	Apply data security techniques to protect data at rest, in transit, and in use.
CO4	Implement secure software development practices using static and dynamic security testing tools.
CO5	Analyze security threats in mobile applications and perform basic mobile security assessments.

COURSE CONTENTS

Module 1: OS Security & Hardening

Basic Concepts of Operating system – Process management- Memory management- File system management- I/O Management , OS Security Architecture (Linux, Windows, Unix), Kernel-Level Security Mechanisms, Access Control Models: DAC, MAC, RBAC, SELinux, AppArmor, Process Isolation and Sandboxing, OS Hardening , Secure Boot and Trusted Platform Module (TPM), Memory Protection: ASLR, DEP, Stack Canaries.



Module 2: Web Application Security

Basic of Web Applications , Introduction to Client Server model - Three-Tier Architecture ,HTML-XML basics- HTTP Protocol, HTTPS - TLS/SSL- Cookies-Sessions-Tokens-Web Proxies-Web services- API Basics – RESTAPI and RESTful API, Web Application Vulnerabilities- OWASP Top 10-Injection attacks (SQL, OS, XSS and CMD, XML Injections)-Cross Site Scripting- Cross site Request Forgery - WAF

Module 3: Data Security & Software Development Life Cycle

Introduction to data security- (Data at rest-transit-use) Data Classification (Public – Private-Internal- Confidential, restricted) - Data Encryption- Data loss prevention- Data Privacy-Database security- Data vault – Data Security Standards- Block chain – Software Development Practice – SDLC.

Module 4: Mobile Application Security

Introduction to Android Architecture, Android File system Structure, Android App fundamentals, and build process, Android Security Model, Device Rooting, Android Debug bridge, Penetration Testing Tools, OWASP Top 10 Mobile App vulnerabilities, Attacks on Android Apps.

Core Compulsory Readings

1. "Operating System Principles, 7TH EBook ", by AviSilberschatz, Greg Gagne, and Peter Baer Galvin.
2. "Windows operating system fundamentals ", by ChristalPanek.
3. "Linux: The complete reference, sixth edition ", by Richard Peterson.
4. Web Security for developers: Real Threats, Practical Defense by Malcom McDonald.
5. Mobile Application Security by Dwivedi and Himanshu, McGraw Hill.
6. Application Security for the Android Platform by Jeff Six.
7. Introduction to Data Security and Controls by Edward R Buck.



TEACHING LEARNING STRATEGIES

- Lecturing, case study/mini projects, Team Learning, presenting seminars on selected topics, Digital Learning

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1.	Attendance	5%
2.	Q Factor (Class room engagement, Response in the class	5%
3.	Quizzes (5 quizzes)	10%
4.	Graded Assignment (4)	20 %
5.	Case study / Course project	20 %
6.	Mid term exam	10 %
7.	Terminal Exam	30 %



CERTIFICATE PROGRAM IN CYBER SECURITY

KUCPDITCS04: Communicative English and Soft Skills

Data Science and AI	Communicative English and Soft Skills			Assessment Weightage (%)		Total Marks
Credit	Teaching Hours					
2	L	P	T	CE	ESE	50
	2	0	0	35	15	

Course Description:

This course aims to improve students' communicative English skills by strengthening listening, speaking, reading, and writing abilities for academic and professional use. It focuses on effective grammar usage, vocabulary development, pronunciation, everyday communication, presentations, and essential soft skills such as teamwork, leadership, time management, and professional etiquette through interactive and practical learning methods.

Course Objectives:

- To develop basic communicative competence in English.
- To enhance listening, speaking, reading, and writing skills.
- To build essential soft skills required for academic and workplace success.
- To improve confidence, interpersonal skills, and professional etiquette.

Course Outcomes:

At the end of the Course, the Student will be able to:



SL #	Course Outcomes
CO1	Communicate effectively in English in everyday and professional contexts.
CO2	Demonstrate improved listening and speaking skills.
CO3	Apply soft skills such as teamwork, leadership, and time management.
CO4	Exhibit professional behavior and workplace etiquette.

COURSE CONTENTS

Module 1: Fundamentals of Communicative English

Importance of English as a global language, Basics of communication: verbal and non-verbal communication, Grammar essentials for communication (tenses, articles, prepositions), Vocabulary building and sentence formation, Common errors and corrective strategies

Module 2: Listening and Speaking Skills

Active listening skills, Pronunciation, stress, and intonation, Everyday conversations and situational dialogues, Public speaking basics and self-introduction, Group discussions and role plays

Module 3: Reading, Writing, and Presentation Skills

Reading comprehension strategies, Paragraph and short essay writing, Formal and informal letter writing, Email writing and basic documentation, Oral presentations and visual aids

Module 4: Soft Skills for Personal and Professional Development

Personality development and self-awareness, Interpersonal skills and teamwork, Time management and goal setting, Leadership skills and problem solving, Professional ethics, etiquette, and interview skills

Core Compulsory Readings

1. Wren & Martin – High School English Grammar and Composition
2. Meenakshi Raman & Sangeeta Sharma – Technical Communication
3. Bhatnagar & Bhatnagar – Communication Skills for Engineers



4. Online resources for English language learning (BBC Learning English, British Council)

TEACHING LEARNING STRATEGIES

- Interactive lectures, Group discussions and activities, Role plays and presentations, Audio-visual learning, Practical exercises and assignments

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %
6	Mid-term exam	10 %
7	Terminal Exam	30 %



CERTIFICATE PROGRAM IN DATA SCIENCE AND AI

1. Introduction

The Certificate Programme in Data Science and Artificial Intelligence is designed to impart foundational knowledge and essential skills related to data-driven technologies and intelligent systems. In the present digital era, data is generated continuously from diverse sources such as digital platforms, smart devices, sensors, social media, and online services. The systematic analysis of such data enables organizations and institutions to make informed decisions, improve efficiency, and develop innovative solutions. Artificial Intelligence enhances these capabilities by enabling systems to learn from data, identify patterns, and support predictive and automated decision-making.

This programme introduces learners to the basic principles of Data Science, including data collection, data preprocessing, exploratory data analysis, and introductory statistical concepts. Alongside, it provides an elementary understanding of Artificial Intelligence and Machine Learning, focusing on concepts rather than mathematical complexity. The curriculum is structured to ensure conceptual clarity and practical relevance, making it suitable for learners who have completed their 10+2 education from any academic stream.

Aligned with national and global skill development initiatives and the growing demand for data-literate professionals, this programme serves as an entry-level pathway to advanced studies and career opportunities in data science, artificial intelligence, analytics, and related domains. The programme also emphasizes ethical considerations, data privacy, and responsible use of AI, ensuring that learners develop awareness of societal and professional responsibilities associated with emerging technologies.

2. Objectives of the Programme

The objectives of the Certificate Programme in Data Science and Artificial Intelligence are to:

- Introduce fundamental concepts and terminology related to Data Science and Artificial Intelligence.
- Develop basic data literacy, including understanding of data types, sources, and data handling processes.
- Provide introductory knowledge of statistics and probability relevant to data analysis.
- Familiarize learners with basic machine learning and artificial intelligence concepts.



- Foster analytical thinking, logical reasoning, and problem-solving skills.
- Prepare learners for higher studies, professional certifications, or entry-level roles in data-centric domains.

3. Programme Outcomes (POs)

On successful completion of the Certificate Programme in Data Science and Artificial Intelligence, the learners will be able to:

- PO1: Explain the fundamental concepts and scope of Data Science and Artificial Intelligence.
- PO2: Identify different types of data and apply basic data preprocessing techniques.
- PO3: Perform elementary data analysis using statistical and graphical methods.
- PO4: Describe basic machine learning concepts and AI-based problem-solving approaches.
- PO5: Interpret real-world applications of data science and AI across multiple sectors.
- PO6: Apply analytical thinking and data-driven reasoning in academic and practical contexts.

4. Eligibility Criteria

The eligibility criteria for admission to the Certificate Programme in Data Science and Artificial Intelligence shall be as follows:

- A pass in 10+2 (Higher Secondary) examination conducted by a recognized board or institution.
- Basic computer literacy and an interest in data-driven technologies are desirable.
- Admission shall be based on University norms, which may include merit-based selection or a department-level screening process



KUCPDITDSAI01: Python Programming

Data Science and AI	Python Programming			Assessment Weightage (%)		Total Marks
Credit	Teaching Hours					
4	L	P	T	CE	ESE	100
	2	2	0	70	30	

Course Description: This course introduces Python programming fundamentals, covering syntax, data types, control structures, and core data structures. It emphasizes modular programming using functions, modules, file handling, exception handling, and basic object-oriented concepts. Students are also introduced to the scientific Python ecosystem for data handling and visualization, and apply their skills through a mini project focused on real-world problem solving.

Course Objectives:

- The course aims to develop a strong foundation in Python programming fundamentals, including syntax, data types, and control structures.
- It focuses on enabling students to use Python data structures, functions, modules, and packages to write modular and reusable programs.
- The course introduces essential software development concepts such as file handling, exception handling, and basic object-oriented programming.
- It trains students to apply Python for data handling, visualization, and real-world problem solving using the scientific Python ecosystem.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
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CO1	Apply Python programming fundamentals, including data types, operators, and control structures, to develop simple programs.
CO2	Use Python data structures, functions, and modules to design modular, efficient, and reusable code.
CO3	Implement file handling, exception handling, and basic object-oriented programming concepts to build robust Python applications.
CO4	Perform basic data cleaning, manipulation, and visualization using Python libraries and complete a mini project addressing a real-world problem.

COURSE CONTENTS

Module 1: Python Basics & Programming Fundamentals

Introduction to Python: Features, installation, IDEs (IDLE, VS Code, Jupyter), Python execution model (script vs interactive), Python Basics: Keywords, identifiers, variables, input/output, Data types: int, float, bool, str, Type conversion, basic operators, expressions, Control Structures: Conditional statements - if, elif, else, Loops: for, while, break, continue, pass

Module 2: Python Data Structures & Functions

Basic Data Structures: Strings and string operations, Lists, tuples, sets, dictionaries – creation & basic operations, Functions: Defining and calling functions, Parameters, return values, default and keyword arguments, Lambda (anonymous) functions, Modules & Packages: Importing modules, creating user-defined modules,

Module 3: File Handling, Modules & Basic OOP

Standard library overview (math, random, os, datetime), File Handling: Text files - open, read, write, append, CSV files basics, Exception Handling: Types of errors, try-except-else-finally, Raising exceptions, Basics of Object-Oriented Programming (OOP): Classes and objects, Attributes and methods, Constructors (`__init__`), self keyword, Basic inheritance (single)

Module 4: Introduction to Data Handling & Mini Project

Introduction to Scientific Python Ecosystem: NumPy, pandas, matplotlib, seaborn, Handling missing values, filtering, grouping, aggregation, Data Cleaning

7	Terminal Exam	30 %
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KUCPDITDSAI02: Mathematical and Statistical Methods for Data Science

Data Science and AI	Mathematical and Statistical Methods for Data Science			Assessment Weightage (%)		Total Marks
Credit	Teaching Hours					
4	L	P	T	CE	ESE	100
	2	2	0	70	30	

Course Description: This course builds a strong mathematical and statistical foundation for data science by integrating R programming, linear algebra, probability, statistics, and multivariate analysis. It covers core mathematical tools, probability distributions, statistical inference, optimization, and simulation techniques, and introduces multivariate methods such as PCA, SVD, and LDA, along with a conceptual overview of Markov processes and Hidden Markov Models to support modern data science applications.

Course Objectives:

- To develop a strong foundation in R programming, linear algebra, and basic statistical concepts required for data science.
- To introduce probability theory, common probability distributions, and correlation analysis for modeling uncertainty in data.



- To enable understanding of statistical inference, hypothesis testing, optimization, and simulation techniques for data analysis.
- To familiarize students with multivariate data analysis methods and the theoretical basis of sequential models used in data science.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Use R programming and linear algebra concepts to represent, manipulate, and visualize data effectively.
CO2	Apply probability theory, correlation measures, and probability distributions to analyze uncertainty and relationships in data.
CO3	Perform basic statistical inference, hypothesis testing, optimization, and simulation to support data-driven decision making.
CO4	Implement and interpret multivariate data analysis techniques and explain the fundamentals of sequential models used in data science.

COURSE CONTENTS

Module 1: Basics of R Programming, Mathematics & Statistics

Introduction to R environment: RStudio, data types, vectors, lists, matrices, data frames, Introduction to linear algebra: Vectors, matrices, Matrix operations, Rank, inverse, eigenvalues and eigenvectors, Basic statistics: Measures of central tendency - mean, median, mode, Measures of dispersion - variance and standard deviation, Skewness and kurtosis, Introduction to data visualization

Module 2: Probability Distributions, Inference & Optimization

Correlation analysis: Pearson correlation, Rank correlation, Intra-class correlation, Basics of probability and random variables, Probability distributions: Discrete - Binomial, Poisson, Multinomial, Continuous - Uniform, Normal, Beta, Gamma, Multivariate normal distribution, Optimization basics: Linear Programming Problems (LPP)



ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %
6	Mid-term exam	10 %
7	Terminal Exam	30 %

KUCPDITDSAI03: Machine Learning and Deep Learning for Data Science

Data Science and AI	Machine Learning and Deep Learning for Data Science			Assessment Weightage (%)		Total Marks
Credit	Teaching Hours					
4	L	P	T	CE	ESE	100
	2	2	0	70	30	



- Lecturing, case study/mini projects, Team Learning, presenting seminars on selected topics, Digital Learning

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %
6	Mid-term exam	10 %
7	Terminal Exam	30 %

KUCPDITDSAI04: Communicative English and Soft Skills

Data Science and AI	Communicative English and Soft Skills	Assessment Weightage (%)	Total Marks
Credit	Teaching Hours		



Module 1: Fundamentals of Communicative English

Importance of English as a global language, Basics of communication: verbal and non-verbal communication, Grammar essentials for communication (tenses, articles, prepositions), Vocabulary building and sentence formation, Common errors and corrective strategies

Module 2: Listening and Speaking Skills

Active listening skills, Pronunciation, stress, and intonation, Everyday conversations and situational dialogues, Public speaking basics and self-introduction, Group discussions and role plays

Module 3: Reading, Writing, and Presentation Skills

Reading comprehension strategies, Paragraph and short essay writing, Formal and informal letter writing, Email writing and basic documentation, Oral presentations and visual aids

Module 4: Soft Skills for Personal and Professional Development

Personality development and self-awareness, Interpersonal skills and teamwork, Time management and goal setting, Leadership skills and problem solving, Professional ethics, etiquette, and interview skills

Core Compulsory Readings

1. Wren & Martin – High School English Grammar and Composition
2. Meenakshi Raman & Sangeeta Sharma – Technical Communication
3. Bhatnagar & Bhatnagar – Communication Skills for Engineers
4. Online resources for English language learning (BBC Learning English, British Council)

TEACHING LEARNING STRATEGIES

- Interactive lectures, Group discussions and activities, Role plays and presentations, Audio-visual learning, Practical exercises and assignments

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial



1. Introduction

The Certificate Programme in IoT Technologies is designed to provide learners with a foundational understanding of the Internet of Things (IoT) and its role in modern digital and cyber-physical systems. IoT refers to the interconnection of physical devices embedded with sensors, software, and communication technologies that enable them to collect, exchange, and process data over the internet. IoT technologies have become integral to diverse application domains such as smart homes, smart cities, healthcare, agriculture, industrial automation, transportation, and environmental monitoring.

This programme introduces learners to the core components of IoT systems, including sensors and actuators, embedded devices, communication protocols, and cloud-based platforms. The curriculum is carefully structured to emphasize conceptual clarity and practical relevance while avoiding advanced mathematical or engineering complexity. This makes the programme suitable for students who have completed their 10+2 education and wish to gain entry-level knowledge in emerging IoT technologies.

Aligned with global trends in Industry 4.0 and digital transformation, the programme aims to build technical awareness and problem-solving skills required to understand real-world IoT solutions. Learners are exposed to practical use cases, basic system design concepts, and the end-to-end workflow of IoT systems, from data sensing to cloud-based visualization. Ethical considerations, data security, and responsible use of connected technologies are also introduced to create awareness of challenges associated with large-scale IoT deployments.

2. Objectives of the Programme

The objectives of the Certificate Programme in IoT Technologies are to:

- Introduce fundamental concepts and architecture of Internet of Things systems.
- Develop understanding of sensors, actuators, and embedded devices used in IoT.
- Familiarize learners with basic communication technologies and protocols in IoT.
- Provide introductory knowledge of cloud platforms and data visualization for IoT applications.
- Enable learners to understand end-to-end IoT workflows through real-world examples.
- Foster analytical and logical thinking for solving simple IoT-based problems.
- Create awareness about data security, privacy, and ethical issues in connected systems.



- Prepare learners for higher studies, advanced certifications, or entry-level opportunities in IoT-related domains.

3. Programme Outcomes (POs)

On successful completion of the Certificate Programme in IoT Technologies, learners will be able to:

PO1: Explain the basic concepts, architecture, and components of IoT systems.

PO2: Identify commonly used sensors, actuators, and embedded platforms in IoT applications.

PO3: Describe communication technologies and protocols used for device connectivity.

PO4: Understand the role of cloud platforms in data storage and visualization.

PO5: Interpret real-world IoT applications across different sectors.

PO6: Demonstrate awareness of security, privacy, and ethical concerns in IoT deployments.

PO7: Apply basic problem-solving and analytical skills in IoT-based case studies.

4. Eligibility Criteria

The eligibility criteria for admission to the Certificate Programme in IoT Technologies shall be as follows:

- A pass in 10+2 (Higher Secondary) examination conducted by a recognized board or institution.
- Basic computer literacy and an interest in data-driven technologies are desirable.
- Admission shall be based on University norms, which may include merit-based selection or a department-level screening process



KUCPDITIOT01: Python Programming

IoT Technologies	Python Programming			Assessment Weightage (%)		Total Marks
Credit	Teaching Hours					
4	L	P	T	CE	ESE	100
	2	2	0	70	30	

Course Description: This course introduces Python programming fundamentals, covering syntax, data types, control structures, and core data structures. It emphasizes modular programming using functions, modules, file handling, exception handling, and basic object-oriented concepts. Students are also introduced to the scientific Python ecosystem for data handling and visualization, and apply their skills through a mini project focused on real-world problem solving.

Course Objectives:

- The course aims to develop a strong foundation in Python programming fundamentals, including syntax, data types, and control structures.
- It focuses on enabling students to use Python data structures, functions, modules, and packages to write modular and reusable programs.
- The course introduces essential software development concepts such as file handling, exception handling, and basic object-oriented programming.
- It trains students to apply Python for data handling, visualization, and real-world problem solving using the scientific Python ecosystem.

Course Outcomes:

At the end of the Course, the Student will be able to:



SL #	Course Outcomes
CO1	Apply Python programming fundamentals, including data types, operators, and control structures, to develop simple programs.
CO2	Use Python data structures, functions, and modules to design modular, efficient, and reusable code.
CO3	Implement file handling, exception handling, and basic object-oriented programming concepts to build robust Python applications.
CO4	Perform basic data cleaning, manipulation, and visualization using Python libraries and complete a mini project addressing a real-world problem.

COURSE CONTENTS

Module 1: Python Basics & Programming Fundamentals

Introduction to Python: Features, installation, IDEs (IDLE, VS Code, Jupyter), Python execution model (script vs interactive), Python Basics: Keywords, identifiers, variables, input/output, Data types: int, float, bool, str, Type conversion, basic operators, expressions, Control Structures: Conditional statements - if, elif, else, Loops: for, while, break, continue, pass

Module 2: Python Data Structures & Functions

Basic Data Structures: Strings and string operations, Lists, tuples, sets, dictionaries – creation & basic operations, Functions: Defining and calling functions, Parameters, return values, default and keyword arguments, Lambda (anonymous) functions, Modules & Packages: Importing modules, creating user-defined modules,

Module 3: File Handling, Modules & Basic OOP

Standard library overview (math, random, os, datetime), File Handling: Text files - open, read, write, append, CSV files basics, Exception Handling: Types of errors, try-except-else-finally, Raising exceptions, Basics of Object-Oriented Programming (OOP): Classes and objects, Attributes and methods, Constructors (`__init__`), self keyword, Basic inheritance (single)



Module 4: Introduction to Data Handling & Mini Project

Introduction to Scientific Python Ecosystem: NumPy, pandas, matplotlib, seaborn, Handling missing values, filtering, grouping, aggregation, Data Cleaning & Preparation: Handling duplicates, missing values, outliers (basic), Type conversion, Data Visualization, Problem definition, data collection, cleaning, modeling, evaluation, Writing clean, modular code and documentation

Core Compulsory Readings

1. VanderPlas, J. (2016). *Python Data Science Handbook*. O'Reilly Media.
2. Martin C. Brown. (2018). *Python: The Complete Reference*. McGraw-Hill Education.
3. Mukku, L., Thomas, J., & Jingle, D. J. (2023). *Quantum Computing with Python: From Theory to Implementation*. CRC Press.

TEACHING LEARNING STRATEGIES

- Lecturing, case study/mini projects, Team Learning, presenting seminars on selected topics, Digital Learning

MODE OF TRANSACTION

- Lecture, Seminar, Discussion, Demonstration, Questioning and Answering, Video tutorial

ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %





Course Objectives:

- To introduce the fundamental concepts, architecture, and components of the Internet of Things (IoT).
- To provide an understanding of smart agriculture and Agriculture 4.0 concepts for data-driven farming.
- To familiarize learners with agricultural sensors, embedded platforms, and IoT communication protocols.
- To develop practical skills in embedded systems programming and sensor interfacing for farming applications.
- To enable learners to design and implement basic IoT-based agricultural monitoring systems.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Explain the architecture, components, and working principles of IoT systems.
CO2	Identify and select appropriate sensors, actuators, microcontrollers, and communication protocols for agricultural applications.
CO3	Interface and calibrate agricultural sensors including soil moisture, temperature, humidity, pH, EC, and light sensors.
CO4	Develop embedded programs using Arduino and ESP32 for real-time data acquisition and control.
CO5	Analyze sensor data for improving irrigation efficiency, soil health, and crop productivity.

COURSE CONTENTS

Module 1 : IoT Fundamentals and Architecture:

Basic concepts of IoT, including perception, network, and service layers; sensors, actuators, and microcontrollers; overview of embedded platforms such as Arduino, ESP32, and Raspberry Pi; communication protocols including WiFi, Bluetooth Low Energy (BLE), LoRa, and ZigBee.

Module 2 : Smart Agriculture and Agriculture 4.0:

Introduction to Agriculture 4.0 concepts such as precision farming, smart irrigation systems, soil health monitoring, greenhouse automation, and weather station integration for data-driven agricultural decision-making.

Module 3 : IoT Hardware and Sensors for Farming:

Study and application of agricultural sensors including soil moisture sensors, temperature and humidity sensors (DHT11/DHT22), pH and electrical conductivity (EC) sensors, light intensity sensors (LDR), water flow and water level sensors, and low-cost agricultural micro-stations.

Module 4 : Embedded Systems Programming, Sensor Interfacing and Data Acquisition

Microcontroller fundamentals using Arduino IDE and ESP32 programming; pin mapping, GPIO control, ADC/DAC concepts; interfacing of soil moisture, temperature, humidity, water level, light intensity, and pH sensors. Sensor calibration techniques, noise reduction and filtering methods, data logging techniques, real-time data display using LCD/OLED, and multi-sensor integration for agricultural monitoring systems.

Core Compulsory Readings

- IoT Fundamentals: Networking Technologies, Protocols, and Use Cases – David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton & Jerome Henry
- Internet of Things – A Hands-On Approach – Arshdeep Bahga & Vijay Madiseti
- Internet of Things: Architecture, Design Principles and Applications – Rajkamal



- To provide knowledge of IoT cloud platforms for data collection, storage, and management.
- To develop skills in real-time data visualization, dashboard and alerting mechanisms.
- To familiarize learners with IoT-enabled smart agriculture applications such as irrigation, crop monitoring, and farm automation.
- To enable students to design data-driven agricultural solutions using IoT communication and cloud technologies.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Explain IoT communication technologies including WiFi, BLE, ZigBee, LoRa, and LoRaWAN for agricultural applications.
CO2	Apply MQTT-based publish-subscribe models for reliable IoT data communication.
CO3	Configure threshold-based alerts using mobile notifications, email, and SMS.
CO4	Analyze stored IoT data to support agricultural decision-making.
CO5	Develop IoT-based smart irrigation and crop monitoring systems.

COURSE CONTENTS

Module 1: IoT Communication Technologies

Fundamentals of IoT wireless communication, short-range communication technologies such as WiFi, Bluetooth Low Energy (BLE), and ZigBee, long-range communication technologies including LoRa and LoRaWAN, comparison of communication protocols for agricultural IoT use cases, network topology concepts, latency, bandwidth and power considerations, introduction to MQTT protocol, publish-subscribe architecture, brokers, topics, QoS levels, and message flow in IoT systems.

Module 2: IoT Cloud Platforms & Data Management





ASSESSMENT RUBRICS

1.	Attendance	5%
2.	Q Factor (Class room engagement, Response in the class	5%
3.	Quizzes (5 quizzes)	10%
4.	Graded Assignment (4)	20 %
5.	Case study / Course project	20 %
6.	Mid term exam	10 %
7.	Terminal Exam	30 %

CERTIFICATE PROGRAM IN IOT TECHNOLOGIES

KUCPDIT04: Communicative English and Soft Skills

Data Science and AI	Communicative English and Soft Skills	Assessment Weightage (%)	Total Marks
Credit	Teaching Hours		

2	L	P	T	CE	ESE	50
	2	0	0	35	15	

Course Description:

This course aims to improve students' communicative English skills by strengthening listening, speaking, reading, and writing abilities for academic and professional use. It focuses on effective grammar usage, vocabulary development, pronunciation, everyday communication, presentations, and essential soft skills such as teamwork, leadership, time management, and professional etiquette through interactive and practical learning methods.

Course Objectives:

- To develop basic communicative competence in English.
- To enhance listening, speaking, reading, and writing skills.
- To build essential soft skills required for academic and workplace success.
- To improve confidence, interpersonal skills, and professional etiquette.

Course Outcomes:

At the end of the Course, the Student will be able to:

SL #	Course Outcomes
CO1	Communicate effectively in English in everyday and professional contexts.
CO2	Demonstrate improved listening and speaking skills.
CO3	Apply soft skills such as teamwork, leadership, and time management.
CO4	Exhibit professional behavior and workplace etiquette.

COURSE CONTENTS



Video tutorial.

ASSESSMENT RUBRICS

1	Attendance	5%
2	Q Factor (Class room engagement, Response in the class	5%
3	Quizzes (5 quizzes)	10 %
4	Graded Assignment (4)	20 %
5	Case study / Course project	20 %
6	Mid-term exam	10 %
7	Terminal Exam	30 %

