

UNIVERSITY OF CALICUT

**BACHELOR OF COMPUTER
APPLICATIONS HONOURS**

(MAJOR, MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS

w.e.f. 2024 admission onwards

(CUFYUGP Regulations 2024)

BACHELOR OF COMPUTER APPLICATIONS
HONOURS
(MAJOR, MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS

PROGRAMME OUTCOMES (PO):

At the end of the graduate programme at Calicut University, a student would:

| | |
|-----|--|
| PO1 | Knowledge Acquisition: Demonstrate a profound understanding of knowledgetrends and their impact on the chosen discipline of study. |
| PO2 | Communication, Collaboration, Inclusiveness, and Leadership: Become a team player who drives positive change through effective communication, collaborative acumen, transformative leadership, and a dedication to inclusivity. |
| PO3 | Professional Skills: Demonstrate professional skills to navigate diverse career paths with confidence and adaptability. |
| PO4 | Digital Intelligence: Demonstrate proficiency in varied digital and technological tools to understand and interact with the digital world, thus effectively processing complex information. |
| PO5 | Scientific Awareness and Critical Thinking: Emerge as an innovative problem-solver and impactful mediator, applying scientific understanding and critical thinking to address challenges and advance sustainable solutions. |
| PO6 | Human Values, Professional Ethics, and Societal and Environmental Responsibility: Become a responsible leader, characterized by an unwavering commitment to human values, ethical conduct, and a fervent dedication to the well-being of society and the environment. |
| PO7 | Research, Innovation, and Entrepreneurship: Emerge as a researcher and entrepreneurial leader, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development. |

PROGRAMME SPECIFIC OUTCOMES (PSO):

At the end of the BCA Honours programme at Calicut University, a student would:

| | |
|------|--|
| PSO1 | Identify the relevance and applications of computers in other disciplines |
| PSO2 | Understand the concepts of system architecture, hardware, software and network configuration |
| PSO3 | Acquire logical thinking and problem-solving skills to find solutions in the software domain |

| | |
|------|---|
| PSO4 | Design, analyse and develop code-based solutions for the algorithms |
| PSO5 | Address the industry demands and assimilate technical, logical and ethical skills needed for the industry |
| PSO6 | Adapt to emerging trends and tackle the challenges in the software field. |

**BCA (HONOURS) PROGRAMME
COURSE STRUCTURE**

Single Major

| Sem ester | Course Code | Course Title | Total Hours | Hours/ Week | | | Credit | Marks | | |
|--------------|---------------------------|---|----------------|----------------|-----------|---|-----------|----------|----------|------------|
| | | | | T | P | T | | Internal | External | Total |
| 1 | BCA1CJ101 | Core Course 1 in Major Fundamentals of Computers and Computational Thinking | 75 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA1CJ 102/ BCA1MN 101 | Core Course 2 in Major Mathematical Foundation for Computer Applications | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA1CJ 103/ BCA1MN 102 | Core Course 3 in Major Discrete Structures for Computer Applications | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA1FM 105 | MDC/MDE – 1 Digital Marketing | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | BCA1FS111 | Skill Enhancement Course 1 Introduction to Computers and Office Automation | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | ENG1FA101(2) | Ability Enhancement Course 1 English | 60 | 2 | 2 | 4 | 3 | 25 | 50 | 75 |
| | | Ability Enhancement Course 2 Additional Language | 45 | 3 | 0 | 3 | 0 | - | - | - |
| | | Total | | | 25 | | 21 | | | 525 |

| | | | | | | | | | | |
|---|--------------------------|--|----|---|-----------|-----------|-----------|----|----|------------|
| 2 | BCA2CJ101 | Core Course 4 in Major Fundamentals of Programming (C Language) | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA2CJ102/ BCA2MN 101 | Core Course 5 in Major Statistical Foundation for Computer Applications | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA2CJ103/ BCA2MN 102 | Core Course 6 in Major Numerical Analysis and Optimization Techniques | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA2FS112 | Skill Enhancement Course 2 Data Analysis using Spread Sheet | 60 | 2 | 2 | 4 | 3 | 25 | 50 | 75 |
| | ENG2FA103(2) | Ability Enhancement Course 3 English | 60 | 2 | 2 | 4 | 3 | 25 | 50 | 75 |
| | | Ability Enhancement Course 4 Additional Language | 45 | 3 | 0 | 3 | - | - | - | - |
| | Total | | | | 24 | 18 | | | | 450 |
| 3 | BCA3CJ201 | Core Course 7 in Major Data Structures using C | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA3CJ202 | Core Course 8 in Major Computer Networks | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA3CJ203/ BCA3MN201 | Core Course 9 in Major Introduction to Data Science | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA3CJ204/ BCA3MN202 | Core Course 10 in Major Foundations of Artificial Intelligence | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA3FS113 | Skill Enhancement Course 3 Website Designing using Content Management System | 60 | 2 | 2 | 4 | 3 | 25 | 50 | 75 |
| | | MDC/MDE 2 – (E/AL) Kerala Knowledge System | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | | Total | | | | 25 | 22 | | | |
| 4 | BCA4CJ205 | Core Course 11 in Major Database Management System | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA4CJ206 | Core Course 12 in Major Python Programming | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA4CJ207 | Core Course 13 in Major Software Engineering | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |

| | | | | | | | | | | |
|---|-------------------------|--|----|---|---|-----------|-----------|-----|----|------------|
| | BCA4CJ208 | Core Course 14 in Major Automation and Robotics | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA4FV108 | Value-Added Course 1 Introduction to Cyber Laws | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | ENG4FV109(2) | Value-Added Course 2 English | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | | Total | | | | 24 | 22 | | | 550 |
| 5 | BCA5CJ301 | Core Course 15 in Major Object Oriented Programming (Java) | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA5CJ302 | Core Course 16 in Major Progressive Web Application using PHP | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA5CJ303 | Core Course 17 in Major Digital Fundamentals and Computer Organization | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA5EJ301(X) | Elective Course 1 in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA5EJ302(X) | Elective Course 2 in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA5FS114 | Skill Enhancement Course 4 Professional Skill Development for IT Career Excellence | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | BCA5FS115 | Skill Enhancement Course Internship 1 | - | | | | 4 | 100 | - | 100 |
| | | Audit Course 1 | - | | | | - | - | - | - |
| | | Total | | | | 25 | 27 | | | 675 |
| 6 | BCA6CJ304/ BCA8MN304 | Core Course 18 in Major Introduction to AI and ML | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA6CJ305/ BCA8MN305 | Core Course 19 in Major Principles of Operating System | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA6EJ303(X) | Elective Course 3 in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA6EJ304(X) | Elective Course 4 in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA6FV110 | Value-Added Course 2 Business Intelligence and Innovation | 45 | 3 | 0 | 3 | 3 | 25 | 50 | 75 |
| | BCA6FS 116 | Skill Enhancement Course Project 1 | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |

| | | | | | | | | | | |
|--------------------------------------|--|--|-----|-----------|------------|----|----|-----|-------------|------------|
| | | Audit Course 2 | - | - | - | - | - | - | - | |
| | | Total | | 25 | 23 | | | | 575 | |
| Total Credits for Three Years | | | | | 133 | | | | 3325 | |
| 7 | BCA7CJ401 | Core Course 20 in Major Advanced Data Structures and Algorithms | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA7CJ402 | Core Course 21 in Major Data Science Programming using R | 75 | 3 | 2 | 5 | 4 | 30 | 70 | 100 |
| | BCA7EJ401(X) | Elective Course 5in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA7EJ402(X) | Elective Course 6in Major | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA7EJ403(X) | Elective Course 7 in Major(in Honours with Research Programme) | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA7OE401(X) | Open Elective in Major(in Honours programme) | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA7FS117 | Skill Enhancement Course Internship 2 | - | - | - | - | 4 | 100 | - | 100 |
| | | Total | | 22 | 24 | | | | 600 | |
| 8 | BCA8EJ404(X) | Elective Course 8in Major(in Honours Programme) | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA8EJ405(X) | Elective Course 9 in Major(in Honours Programme) | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA8EJ406(X) | Elective Course 10 in Major(in Honours Programme) | 60 | 4 | 0 | 4 | 4 | 30 | 70 | 100 |
| | BCA8FS118 | Skill Enhancement Course Project 2 (in Honours Programme) | 120 | 8 | 0 | 8 | 8 | 60 | 140 | 200 |
| | OR (instead of Elective Course 8– 10 in Major) | | | | | | | | | |
| | BCA8FS119 | Skill Enhancement Course Research Project (in Honours with Research Programme) | 300 | 20 | 0 | 20 | 20 | 150 | 350 | 500 |
| | | Total | | 20 | 20 | | | | | 500 |
| Total Credits for Four Years | | | | | 177 | | | | 4425 | |

Note

1. Core Courses 2, 5, & 9 can be offered to students of other Major disciplines as Minor courses of Group I, and Core courses 3, 6 & 10 can be offered to them as Minor courses of Group II. 1. Core Courses 18 & 19 can be offered to eighth semester students of other Major disciplines as Minor courses.
2. There will be no pathway for BCA students.
3. Students from other disciplines can choose Minor Groups in BCA.
4. If a student from other department chooses Minor Group I in BCA, then the title of the Minor will be **Data Science**.
5. If a student from other department chooses Minor Group II in BCA, then the title of the Minor will be **Artificial Intelligence**.
6. If a student from other department chooses two Minor groups in BCA (Major with Minor Pathway), then the title of the Minor will be **Data Science and Artificial Intelligence**.

Audit Courses

There are four mandatory Audit Courses or zero-credit courses that the students must attend in different semesters. Two of them are Ability Enhancement Courses offered by Additional Languages in the first and second semesters. The other two are Discipline Specific Elective courses in the fifth and sixth semesters. Students need to complete 75% attendance in Ability Enhancement Courses offered by Additional Languages in the first and second semesters, but need not appear for the internal and external evaluation of these courses. Discipline Specific Elective courses in the fifth and sixth semesters are not meant for class room study. The students can choose any course in Computer Science/Application/IT discipline and attend these courses online in platforms like SWAYAM, MOOC etc.

CREDIT DISTRIBUTION

| Semester | Major Core Courses | Major DSE | General Foundation Courses | | | | | Total |
|--|--------------------|------------------|----------------------------|-------------|----------|-----------|------------------------|------------|
| | | | AEC | MDC/ MDE | VAC | SEC | Internship/ Project | |
| 1 | 4+4+4 | | 3 | 3 | | 3 | - | 21 |
| 2 | 4+4+4 | | 3 | | | 3 | - | 18 |
| 3 | 4+4+4+4 | | | 3 | | 3 | - | 22 |
| 4 | 4 + 4 + 4 + 4 | | | | 3 + 3 | | - | 22 |
| 5 | 4 + 4 + 4 | 4 + 4 | | | | 3 | 4 | 27 |
| 6 | 4 + 4 | 4 + 4 | | | 3 | | 4 | 23 |
| Total for Three Years | 76 | 16 | 6 | 6 | 9 | 12 | 8 | 133 |
| 7 | 4 + 4 | 4 + 4+4 | | 4* | | | 4 | 24 |
| 8 | | 4 + 4 + 4 | | | | | 8 / 20** | 20 |
| * Instead of Major DSE Course; **Instead of Three Major DSE & 8 Credit Project | | | | | | | | |
| Total for Four Years | 76+8 = 84 | 16+24= 40 | 6 | 6 | 9 | 12 | 20 | 177 |

DISTRIBUTION OF MAJOR COURSES IN BCA

| Semester | Course Code | Course Title | Hours/Week | Credits |
|----------|--------------------------|---|------------|---------|
| 1 | BCA1CJ101 | Core Course 1 in Major – Fundamentals of Computers and Computational thinking | 4 | 4 |
| | BCA1CJ 102/ BCA1MN101 | Core Course 2 in Major- Mathematical Foundation for Computer Applications | 4 | 4 |
| | BCA1CJ 103/ BCA1MN102 | Core Course 3 in Major -Discrete Structures for Computer Applications | 4 | 4 |

| | | | | |
|---|-------------------------|--|---|---|
| 2 | BCA2CJ101 | Core Course 4 in Major –Fundamentals of Programming (C Language) | 5 | 4 |
| | BCA2CJ102/ BCA2MN101 | Core Course 5 in Major -Statistical Foundation for Computer Applications | 4 | 4 |
| | BCA2CJ103/ BCA2MN102 | Core Course 6 in Major - Numerical Analysis and Optimization Techniques | 4 | 4 |
| 3 | BCA3CJ201 | Core Course 7 in Major – Data Structures using C | 5 | 4 |
| | BCA3CJ202 | Core Course 8 in Major –Computer Networks | 5 | 4 |
| | BCA3CJ203/ BCA3MN201 | Core Course 9 in Major - Introduction to Data Science | 4 | 4 |
| | BCA3CJ204/ BCA3MN202 | Core Course 10 in Major - Foundations of Artificial Intelligence | 4 | 4 |
| 4 | BCA4CJ205 | Core Course 11 in Major – Database Management System | 5 | 4 |
| | BCA4CJ206 | Core Course 12 in Major – Python Programming | 5 | 4 |
| | BCA4CJ207 | Core Course 13 in Major - Software Engineering | 4 | 4 |
| | BCA4CJ208 | Core Course 14 in Major – Automation and Robotics | 4 | 4 |
| 5 | BCA5CJ301 | Core Course 15 in Major – Object Oriented Programming in Java | 5 | 4 |
| | BCA5CJ302 | Core Course 16 in Major – Progressive Web Application using PHP | 5 | 4 |
| | BCA5CJ303 | Core Course 17 in Major – Digital Fundamentals and Computer Organization | 4 | 4 |

| | | | | |
|----------------------------------|--------------|---|---|------------|
| | BCA5EJ301(X) | Elective Course 1 in Major | 4 | 4 |
| | BCA5EJ302(X) | Elective Course 2 in Major | 4 | 4 |
| 6 | BCA6CJ304 | Core Course 18 in Major – Introduction to AI and ML | 5 | 4 |
| | BCA6CJ305 | Core Course 19 in Major – Principles of Operating System | 5 | 4 |
| | BCA6EJ303(X) | Elective Course 3 in Major | 4 | 4 |
| | BCA6EJ304(X) | Elective Course 4 in Major | 4 | 4 |
| Total for the Three Years | | | | 92 |
| 7 | BCA7CJ401 | Core Course 20 in Major – Advanced Data Structures and Algorithms | 5 | 4 |
| | BCA7CJ402 | Core Course 21 in Major – Data Science Programming using R | 5 | 4 |
| | BCA7EJ401(X) | Elective Course 5 in Major | 4 | 4 |
| | BCA7EJ402(X) | Elective Course 6 in Major | 4 | 4 |
| | BCA7EJ403(X) | Elective Course 7 (in Honours with Research Programme) | 4 | 4 |
| | BCA7OE401(X) | Open Elective in Major (in Honours Programme) | 4 | 4 |
| 8 | BCA8EJ404(X) | Elective Course 8 (in Honours Programme) | 4 | 4 |
| | BCA8EJ405(X) | Elective Course 9 (in Honours Programme) | 4 | 4 |
| | BCA8EJ406(X) | Elective Course 10 (in Honours Programme) | 4 | 4 |
| Total for the Four Years | | | | 124 |

ELECTIVE COURSES IN BCA WITH SPECIALISATION

| Group No. | Sl. No. | Course Code | Title | Seme ster | Total Hrs | Hrs/ Week | Cre dits | Marks | | |
|-----------|----------------------------|--------------|---|-----------|-----------|-----------|----------|-----------|-----------|-------|
| | | | | | | | | Inte rnal | Exte rnal | Total |
| 1 | Image Processing | | | | | | | | | |
| | 1 | BCA5EJ301(1) | Fundamentals of Digital Image Processing | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA5EJ302(1) | Pattern Recognition | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA6EJ303(1) | Advanced Digital Image Processing and Computer Vision | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 4 | BCA6EJ304(1) | Applied Digital Image Processing | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| 2 | Computer Networks | | | | | | | | | |
| | 1 | BCA5EJ301(2) | Wireless Communication | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA5EJ302(2) | Cryptography and Network Security | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA6EJ303(2) | Storage Area Network | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 4 | BCA6EJ304(2) | Internet of Things | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| 3 | Cloud Computing | | | | | | | | | |
| | 1 | BCA5EJ301(3) | Cloud Computing | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA5EJ302(3) | Security and Privacy in Cloud | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA6EJ303(3) | Storage Technologies | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 4 | BCA6EJ304(3) | Virtualization | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| 4 | Data Science and AI | | | | | | | | | |
| | 1 | BCA5EJ301(4) | Data Analytics and Visualization | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA5EJ302(4) | Knowledge Engineering | 5 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA6EJ303(4) | Advanced Python for Data Science | 6 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 4 | BCA6EJ304(4) | Neural Networks and Deep Learning | 6 | 60 | 4 | 4 | 30 | 70 | 100 |

ELECTIVE COURSES IN BCA WITH NO SPECIALISATION

| Semester | Elective No. | Course Code | Title | Total Hrs | Hrs/Week | Credits | Marks | | |
|----------|--------------|--------------|--|-----------|----------|---------|----------|----------|-------|
| | | | | | | | Internal | External | Total |
| 7 | EL-5 | BCA7EJ401(1) | Theory of Computation | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA7EJ401(2) | Expert Systems and Fuzzy Logic | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA7EJ401(3) | Modern Cryptography | 60 | 4 | 4 | 30 | 70 | 100 |
| | EL-6 | BCA7EJ402(1) | Client Server Architecture | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA7EJ402(2) | Blockchain Technology | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA7EJ402(3) | Data Mining | 60 | 4 | 4 | 30 | 70 | 100 |
| | EL-7 | BCA7EJ403(1) | Research Methodology in Computer Science | 60 | 4 | 4 | 30 | 70 | 100 |
| | OE-1 | BCA7OE401(1) | Ethical Hacking | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA7OE401(2) | Cyber Forensics | 60 | 4 | 4 | 30 | 70 | 100 |
| 8 | EL-8 | BCA8EJ404(1) | Compiler Design | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA8EJ404(2) | Mixed Reality | 60 | 4 | 4 | 30 | 70 | 100 |
| | EL-9 | BCA8EJ405(1) | Mastering Java Web Development | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA8EJ405(2) | Social Network Analysis | 60 | 4 | 4 | 30 | 70 | 100 |
| | EL-10 | BCA8EJ406(1) | System Security | 60 | 4 | 4 | 30 | 70 | 100 |
| | | BCA8EJ406(2) | Parallel Computing | 60 | 4 | 4 | 30 | 70 | 100 |

DISTRIBUTION OF GENERAL FOUNDATION COURSES IN BCA

| Sl. No. | Course Code | Course Title | Total Hours | Hours/ Week | Credits | Marks | | |
|---------|-------------------------|---|-------------|-------------|---------|----------|-------------|-------------|
| | | | | | | Internal | External | Total |
| 1 | BCA1FM 105 | MDC/MDE – 1 Digital Marketing | 45 | 3 | 3 | 25 | 50 | 75 |
| 2 | BCA4FV108 | Value-Added Course 1 Introduction to Cyber Laws | 45 | 3 | 3 | 25 | 50 | 75 |
| 3 | BCA6FV110 | Value-Added Course 2 Business Intelligence and Innovation | 45 | 3 | 3 | 25 | 50 | 75 |
| 4 | BCA1FS111 | Skill Enhancement Course 1 Introduction to Computers and Office Automation | 45 | 3 | 3 | 25 | 50 | 75 |
| 5 | BCA2FS112 | Skill Enhancement Course 2 Data Analysis using Spread Sheet | 60 | 4 | 3 | 25 | 50 | 75 |
| 6 | BCA3FS113 | Skill Enhancement Course 3 Website Designing using Content Management System | 60 | 4 | 3 | 25 | 50 | 75 |
| 7 | BCA5FS114 | Skill Enhancement Course 4 Professional Skill Development for IT Career Excellence | 45 | 3 | 3 | 25 | 50 | 75 |
| 8 | BCA5FS115 | Internship | 60 | - | 4 | 100 | | 100 |
| 9 | BCA6FS116 | Project Implementation | 60 | 4 | 4 | 30 | 70 | 100 |
| 10 | BCA7FS117 | Internship | 60 | - | 4 | 100 | | 100 |
| 11 | BCA8FS118/ BCA8FS119 | Project (in Honours Programme)/ Research Project (in Honours with Research | 200/ 500 | 8/20 | 8/20 | 60/ 150 | 140/ 350 | 200/ 500 |

GROUPING OF MINOR COURSES IN BCA

For Other Departments

(Title of the Minor: **Data Science and Artificial Intelligence**)

| Group No. | Sl. No. | Course Code | Title | Semester | Total Hrs | Hrs/Week | Credits | Marks | | |
|--------------------------------|---------|-------------|---|----------|-----------|----------|---------|----------|----------|-------|
| | | | | | | | | Internal | External | Total |
| Data Science | | | | | | | | | | |
| 1 | 1 | BCA1MN 101 | Mathematical Foundation for Computer Applications | 1 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA2MN 101 | Statistical Foundation for Computer Applications | 2 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA3MN201 | Introduction to Data Science | 3 | 60 | 4 | 4 | 30 | 70 | 100 |
| Artificial Intelligence | | | | | | | | | | |
| 2 | 1 | BCA1MN 102 | Discrete Structures for Computer Applications | 1 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 2 | BCA2MN 102 | Numerical Analysis and Optimization Techniques | 2 | 60 | 4 | 4 | 30 | 70 | 100 |
| | 3 | BCA3MN202 | Foundations of Artificial Intelligence | 3 | 60 | 4 | 4 | 30 | 70 | 100 |

| Group No. | Sl. No. | Course Code | Title | Semester | Total Hrs | Hrs/Week | Credits | Marks | | |
|--|---------|-------------|--------------------------------|----------|-----------|----------|---------|----------|----------|-------|
| | | | | | | | | Internal | External | Total |
| 4th Year Minor Courses | | | | | | | | | | |
| 1 | 1 | BCA8MN304 | Introduction to AI and ML | 8 | 75 | 5 | 4 | 30 | 70 | 100 |
| | 2 | BCA8MN305 | Principles of Operating System | 8 | 75 | 5 | 4 | 30 | 70 | 100 |

EVALUATION SCHEME

1. The evaluation scheme for each course contains two parts: internal evaluation (about 30%) and external evaluation (about 70%). Each of the Major and Minor courses is of 4-credits. It is evaluated for 100 marks, out of which 30 marks is from internal evaluation and 70 marks, from external evaluation. Each of the General Foundation course is of 3-credits. It is evaluated for 75 marks, out of which 25 marks is from internal evaluation and 50 marks, from external evaluation.
2. The 4-credit courses (Major and Minor courses) are of two types: (i) courses with only theory and (ii) courses with 3-credit theory and 1-credit practical.
 - In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 10 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.
 - In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical. The practical component is internally evaluated for 20 marks. The internal evaluation of the 4 theory modules is for 10 marks.
3. 3-credit courses (General Foundational Courses) in BCA are of two types: (i) courses with only theory and (ii) courses with 2-credit theory and 1-credit practical.
 - In 3-credit course with only theory out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 5 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.
 - In 3-credit courses with 2-credit and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practicals. The practical component is internally evaluated for 15 marks. The internal evaluation of the 4 theory modules is for 10 marks.

| Sl. No. | Nature of the Course | | Internal Evaluation in Marks (about 30% of the total) | | External Exam on 4 modules (Marks) | Total Marks |
|---------|----------------------|--------------------------------|--|------------------------|--|-------------|
| | | | Open-ended module / Practical | On the other 4 modules | | |
| 1 | 4-credit course | only theory (5 modules) | 10 | 20 | 70 | 100 |
| 2 | 4-credit course | Theory (4 modules) + Practical | 20 | 10 | 70 | 100 |
| 3 | 3-credit course | only theory (5 modules) | 5 | 20 | 50 | 75 |
| 4 | 3-credit course | Theory (4 modules) + Practical | 15 | 10 | 50 | 75 |

1. MAJOR AND GENERAL FOUNDATION COURSES

1.1. INTERNAL EVALUATION OF THEORY COMPONENT

| Sl. No. | Components of Internal Evaluation of Theory Part of a Major / Minor Course | Internal Marks for the Theory Part of a Major / Minor Course of 4-credits | | | |
|---------|--|---|-------------------|--------------------|-----------|
| | | Theory Only | | Theory + Practical | |
| | | 4 Theory Modules | Open-ended Module | 4 Theory Modules | Practical |
| 1 | Test paper/ Mid-semester Exam | 10 | 4 | 5 | - |
| 2 | Seminar/ Viva/ Quiz | 6 | 4 | 3 | - |
| 3 | Assignment | 4 | 2 | 2 | - |
| Total | | 20 | 10 | 10 | 20* |
| | | 30 | | 30 | |

* Refer the table in section 1.2 for the evaluation of practical component

1.2. EVALUATION OF PRACTICAL COMPONENT

The evaluation of practical component in Major and Minor courses is completely by internal evaluation.

- Continuous evaluation of practical by the teacher-in-charge shall carry a weightage of 50%.
- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the teacher in-charge and an internal examiner appointed by the Department Council.
- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end-semester examination and viva-voce.

The scheme of continuous evaluation and the end-semester examination and viva-voce of practical component shall be as given below:

| Sl. No. | Evaluation of Practical Component of Credit-1 in a Major / Minor Course | Marks for Practical | Weightage |
|-------------|---|---------------------|-----------|
| 1 | Continuous evaluation of practical/ exercise performed in practical classes by the students | 10 | 50% |
| 2 | End-semester examination and viva-voce to be conducted by teacher-in-charge along with an additional examiner arranged internally by the Department Council | 7 | 35% |
| 3 | Evaluation of the Practical records submitted for the end semester viva-voce examination by the teacher-in-charge and additional examiner | 3 | 15% |
| Total Marks | | 20 | |

1.3. EXTERNAL EVALUATION OF THEORY COMPONENT

External evaluation carries 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR MAJOR COURSES

| Duration | Type | Total No. of Questions | No. of Questions to be Answered | Marks for Each Question | Ceiling of Marks |
|-------------|--------------------|------------------------|---------------------------------|-------------------------|------------------|
| 2 Hours | Short Answer | 10 | 8 – 10 | 3 | 24 |
| | Paragraph/ Problem | 8 | 6 – 8 | 6 | 36 |
| | Essay | 2 | 1 | 10 | 10 |
| Total Marks | | | | | 70 |

PATTERN OF QUESTION PAPER FOR GENERAL FOUNDATION COURSES

| Duration | Type | Total No. of Questions | No. of Questions to be Answered | Marks for Each Question | Ceiling of Marks |
|-------------|--------------------|------------------------|---------------------------------|-------------------------|------------------|
| 1.5 Hours | Short Answer | 10 | 8 – 10 | 2 | 16 |
| | Paragraph/ Problem | 5 | 4 – 5 | 6 | 24 |
| | Essay | 2 | 1 | 10 | 10 |
| Total Marks | | | | | 50 |

2. INTERNSHIP

- All students should undergo **TWO** Internship of 4-credits during the FIFTH and SEVENTH semesters in a firm, industry or organization, or training in labs with faculty and researchers of their own institution or other Higher Educational Institutions (HEIs) or research institutions.
- Internship can be for enhancing the employability of the student or for developing the research aptitude.
- Internship can involve hands-on training on a particular skill/ equipment/ software. It can be a short project on a specific problem or area. Attending seminars or workshops related to an area of learning or skill can be a component of Internship.
- A faculty member/ scientist/ instructor of the respective institution, where the student does the Internship, should be the supervisor of the Internship.

2.1. GUIDELINES FOR INTERNSHIP

1. Internship can be in Computer application or allied disciplines.
2. There should be minimum 120 hrs. of engagement from the student in the Internship.

3. Summer vacations and other holidays can be used for completing the Internship.
4. In BCA Honours programme, institute/ industry visit or study tour is a requirement for the completion of Internship. Visit to minimum one national research institute, research laboratory and place of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos and analysis.
5. The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.
6. The log book and the typed report must be submitted at the end of the Internship.
7. The institution at which the Internship will be carried out should be prior-approved by the Department Council of the college where the student has enrolled for the UG (Honours) programme.

2.2. EVALUATION OF INTERNSHIP

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG (Honours) programme.
- The credits and marks for the Internship will be awarded only at the end of. semester 5 & semester 7.
- The scheme of continuous evaluation and the end-semester viva-voce examination based on the submitted report shall be as given below:

| Sl. No. | Components of Evaluation of Internship | | Marks for Internship 4Credits | Weightage |
|---------|---|------------------------------------|----------------------------------|-----------|
| 1 | Continuous evaluation of internship through interim presentations and reports by the committee internally constituted by the Department Council | Acquisition of skill set | 20 | 40% |
| 2 | | Interim Presentation and Viva-voce | 10 | |
| 3 | | Punctuality and Log Book | 10 | |

| | | | |
|-------------|--|--------------------------|-----|
| 4 | Report of Institute Visit/ Study Tour | 10 | 10% |
| 5 | End-semester viva-voce examination to be conducted by the committee internally constituted by the Department Council | Quality of the work | 35% |
| 6 | | Presentation of the work | |
| 7 | | Viva-voce | |
| 8 | Evaluation of the day-to-day records, the report of internship supervisor, and final report submitted for the end semester viva-voce examination before the committee internally constituted by the Department Council | 16 | 15% |
| Total Marks | | 10 | |

2. PROJECT

3.1 MINI PROJECT WORK (Skill Enhancement Course BCA6FS116)

A mandatory mini-project is scheduled in the VI Semester of the BCA Honours program. It is designed to cultivate students' research and software development skills. It will serve as a capstone experience, allowing students to bridge the gap between theoretical knowledge acquired in the classroom and its practical application to real-world problems.

Project Selection and Approval:

- Student groups (at most four members) can propose projects in Information Technology or related disciplines.
- Projects can be experimental (building a prototype), theoretical (a research paper), or computational (implementing an algorithm).
- Project proposals must be submitted for prior approval from the Department Council.
- Each project team will be assigned a project supervisor for guidance.

Project Duration:

- The mini-project duration is one semester.
- Minimum engagement: 90 hours per student.

Project Deliverables:

- Two hard copies and one softcopy of a well-structured typed report outlining:
 - Project objectives and requirements analysis
 - System design and architecture

- Implementation details (including sample code snippets)
- Test cases and results
- Conclusion and future work
- A signed undertaking by the student declaring the originality of the work and the absence of plagiarism.
- A certificate from the project supervisor confirming the same.

Evaluation Criteria and Rubrics:

1. Internal Evaluation (30%) - Conducted by the project supervisor throughout the semester.

This could involve:

- **Project Proposal and Planning (10%):**
 - Clarity of project goals and objectives.
 - Feasibility of the chosen approach.
 - Quality of system study/literature review and proposed methodology.
 - Clarity of project schedule and division of tasks within the team.
- **Project Progress and Implementation (10%):**
 - Regular code reviews and adoption of feedback provided by the supervisor.
 - Attendance and active participation in project meetings.
 - Completion of project milestones as planned.
 - Quality of code documentation and adherence to coding standards.
- **Interim Presentations (10%):**
 - Effectiveness of communication and presentation skills.
 - Clarity of technical details and progress made.
 - Ability to answer questions about the project effectively.

2. External Evaluation (70%) - Conducted by an internal examiner appointed by the Department Council and the project supervisor. This will take place at the end of the VIth semester:

- **Project Report (25%):**
 - Content: Completeness, organisation, clarity, and technical accuracy.
 - Structure: Introduction, System Design/literature review, methodology, implementation details, results, discussion, conclusion, future work, and references.

- Presentation: Quality of writing, grammar, and formatting.
- **Project Demonstration (25%):**
 - Demonstration: Ability to showcase the functionality of the project or present the research findings effectively.
- **Viva-voce (20%):**
 - Viva-voce: Understanding of project concepts, ability to answer questions confidently, and critical thinking skills

3.2. PROJECT IN HONOURS PROGRAMME

- In Honours programme, the student has the option to do a Project of 8-credits along with three Core Courses in Major in semester 8.
- The Project can be done in the same institution or any other higher educational institution (HEI) or research centre.
- A faculty member of the respective institution, where the student does the Project, should be the supervisor of the Project.

3.3. PROJECT IN HONOURS WITH RESEARCH PROGRAMME

- Students who secure 75% marks and above (equivalently, CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the fourth year.
- In Honours with Research programme, the student has to do a mandatory Research Project of 20-credits in semester 8.
- The approved research centres of University of Calicut or any other university/ HEI can offer the Honours with Research programme. The departments in the affiliated colleges under University of Calicut, which are not the approved research centres of the University, should get prior approval from the University to offer the Honours with Research programme. Such departments should have minimum one faculty member with Ph.D., and they should also have the necessary infrastructure to offer Honours with Research programme.

- A faculty member of the University/ College with a Ph.D. degree can supervise the research project of the students who have enrolled for Honours with Research. One such faculty member can supervise maximum four students in Honours with Research stream.
-

3.4. GUIDELINES FOR THE PROJECT IN HONOURS PROGRAMME AND HONOURS WITH RESEARCH PROGRAMME

1. Project can be in Computer application or allied disciplines.
2. Project should be done individually.
3. Project work can be of experimental/ theoretical/ computational in nature.
4. There should be minimum 240 hrs. of engagement from the student in the Project work in Honours programme.
5. There should be minimum 360 hrs. of engagement from the student in the Project work in Honours with Research programme.
6. The various steps in project works are the following:
 - Wide review of a topic.
 - Investigation on a problem in systematic way using appropriate techniques.
 - Systematic recording of the work.
 - Reporting the results with interpretation in a standard documented form.
 - Presenting the results before the examiners.
7. During the Project the students should make regular and detailed entries in to a personal log book through the period of investigation. The log book will be a record of the progress of the Project and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Project supervisor should periodically examine and countersign the log book.
8. The log book and the typed report must be submitted at the end of the Project. A copy of the report should be kept for reference at the department. A soft copy of the report too should be submitted, to be sent to the external examiner in advance.
9. It is desirable, but not mandatory, to publish the results of the Project in a peer reviewed journal.

10. The project report shall have an undertaking from the student and a certificate from the research supervisor for originality of the work, stating that there is no plagiarism, and that the work has not been submitted for the award of any other degree/ diploma in the same institution or any other institution.
11. The project proposal, institution at which the project is being carried out, and the project supervisor should be prior-approved by the Department Council of the college where the student has enrolled for the UG (Honours) programme.

3.5. EVALUATION OF PROJECT

- The evaluation of Project will be conducted at the end of the eighth semester by both internal and external modes.
- The Project in Honours programme will be evaluated for 200 marks. Out of this, 60 marks is from internal evaluation and 140 marks, from external evaluation.
- The Project in Honours with Research programme will be evaluated for 500 marks. Out of this, 150 marks is from internal evaluation and 350 marks, from external evaluation.
- The internal evaluation of the Project work shall be done through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG (Honours) programme. 30% of the weightage shall be given through this mode.
- The remaining 70% shall be awarded by the external examiner appointed by the University.
- The scheme of continuous evaluation and the end-semester viva-voce of the Project shall be as given below:

| Components of Evaluation of Project | Marks for the Research Project (Honours with Research) | Marks for the Optional Project (Honours) | Weightage |
|--|--|--|-----------|
| | 20 Credits | 8 Credits | |
| Continuous evaluation of project work through interim presentations and reports by the | 150 | 60 | 30% |

| | | | |
|---|-----|-----|-----|
| committee internally constituted by the Department Council | | | |
| End-semester viva-voce examination to be conducted by the external examiner appointed by the university | 250 | 100 | 50% |
| Evaluation of the day-to-day records and project report submitted for the end-semester viva-voce examination conducted by the external examiner | 100 | 40 | 20% |
| Total Marks | 500 | 200 | |

INTERNAL EVALUATION OF PROJECT

| Sl. No | Components of Evaluation of Project | Marks for the Research Project (Honours with Research programme) 20 credits | Marks for the Optional Project (Honours programme) 8 credits |
|-------------|--|---|--|
| 1 | Skill in doing project work | 50 | 20 |
| 2 | Interim Presentation and Viva-Voce | 35 | 15 |
| 3 | Punctuality and Log book | 35 | 15 |
| 4 | Scheme/ Organization of Project Report | 30 | 10 |
| Total Marks | | 150 | 60 |

EXTERNAL EVALUATION OF PROJECT

| Sl. No | Components of Evaluation of Project | Marks for the Research Project (Honours with Research programme) 20 credits | Marks for the Optional Project (Honours programme) 8 credits |
|-------------|---|---|--|
| 1 | Content and relevance of the Project, Methodology, Quality of analysis, and Innovations of Research | 100 | 40 |
| 2 | Presentation of the Project | 75 | 30 |
| 3 | Project Report (typed copy), Log Book and References | 100 | 40 |
| 4 | Viva-Voce | 75 | 30 |
| Total Marks | | 350 | 140 |

5.LETTER GRADES AND GRADE POINTS

- Mark system is followed for evaluating each question.
- For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given below.
- The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester.
- The Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.
- Only the weighted grade point based on marks obtained shall be displayed on the grade card issued to the students.

LETTER GRADES AND GRADE POINTS

| Sl. No. | Percentage of Marks (Internal & External Put Together) | Description | Letter Grade | Grade Point | Range of Grade Points | Class |
|---------|---|---------------|--------------|-------------|-----------------------|------------------------------|
| 1 | 95% and above | Outstanding | O | 10 | 9.50 – 10 | First Class with Distinction |
| 2 | Above 85% and below 95% | Excellent | A+ | 9 | 8.50 – 9.49 | |
| 3 | 75% to below 85% | Very Good | A | 8 | 7.50 – 8.49 | |
| 4 | 65% to below 75% | Good | B+ | 7 | 6.50 – 7.49 | First Class |
| 5 | 55% to below 65% | Above Average | B | 6 | 5.50 – 6.49 | |
| 6 | 45% to below 55% | Average | C | 5 | 4.50 – 5.49 | Second Class |
| 7 | 35% to below 45% aggregate (internal and external put together) with a minimum of 30% in external valuation | Pass | P | 4 | 3.50 – 4.49 | Third Class |
| 8 | Below an aggregate of 35% or below 30% in external evaluation | Fail | F | 0 | 0 – 3.49 | Fail |

| | | | | | | |
|---|-------------------------------|--------|----|---|---|------|
| 9 | Not attending the examination | Absent | Ab | 0 | 0 | Fail |
|---|-------------------------------|--------|----|---|---|------|

- When students take audit courses, they will be given Pass (P) or Fail (F) grade without any credits.
- The successful completion of all the courses and capstone components prescribed for the three-year or four-year programme with 'P' grade shall be the minimum requirement for the award of UG Degree or UG Degree (Honours) or UG Degree (Honours with Research), as the case may be.

5.1. COMPUTATION OF SGPA AND CGPA

- The following method shall be used to compute the Semester Grade Point Average (SGPA):

The SGPA equals the product of the number of credits (C_i) with the grade points (G_i) scored by a student in each course in a semester, summed over all the courses taken by a student in the semester, and then divided by the total number of credits of all the courses taken by the student in the semester,

$$\text{i.e. SGPA } (S_i) = \frac{\sum_i (C_i \times G_i)}{\sum_i (C_i)}$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course in the given semester. Credit Point of a course is the value obtained by multiplying the credit (C_i) of the course by the grade point (G_i) of the course.

ILLUSTRATION – COMPUTATION OF SGPA

| Semester | Course | Credit | Letter Grade | Grade point | Credit Point (Credit x Grade) |
|----------|----------|--------|--------------|-------------|----------------------------------|
| I | Course 1 | 3 | A | 8 | 3 x 8 = 24 |
| I | Course 2 | 4 | B+ | 7 | 4 x 7 = 28 |
| I | Course 3 | 3 | B | 6 | 3 x 6 = 18 |
| I | Course 4 | 3 | O | 10 | 3 x 10 = 30 |
| I | Course 5 | 3 | C | 5 | 3 x 5 = 15 |

| | | | | | |
|---|----------|----|---|---|-------------------|
| I | Course 6 | 4 | B | 6 | $4 \times 6 = 24$ |
| | Total | 20 | | | 139 |
| | SGPA | | | | $139/20 = 6.950$ |

- The Cumulative Grade Point Average (CGPA) of the student shall be calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students.

CGPA for the three-year programme in CUFYUGP shall be calculated by the following formula.

CGPA for the four-year programme in CUFYUGP shall be calculated by the following formula.

- The SGPA and CGPA shall be rounded off to three decimal points and reported in the transcripts.
- Based on the above letter grades, grade points, SGPA and CGPA, the University shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.