

# **COURSE CURRICULUM**

**Bachelor of Computer Applications (BCA)**

Batch:2023-2024  
Academic Year: 2024-25  
Updated on: July, 2023

GSFC University School of Technology,  
Vigyan Bhavan, P. O. Fertilizer Nagar,  
Vadodara - 391750, Gujarat, India

## VISION

- GSFCU strives to be the best compact boutique institution with a futuristic approach, encouraging student centric culture and sharpened focus on developing industry ready & employable students with all-round development.

## MISSION

- Establish an institution, which promotes creativity and innovation.
- Develop unique quality standards for academic excellence and pedagogical innovations.
- Remain agile through a learning ecosystem with flexible processes & systems.
- Holistic growth for industry readiness.

| No. | Programme Outcomes (POs)  | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain |
|-----|---|-------------------------|-----------------------------|
| PO1 | Basic Knowledge: To understand and apply the fundamental principles, concepts and methods in key areas of Computer Applications and multidisciplinary fields.   | Cognitive domain        | Understand, Apply           |
| PO2 | Problem Analysis: Ability to analyze real-time problems using various tools and techniques.   | Cognitive domain        | Apply, Analyze              |
| PO3 | Practical learning: Ability to engage in continuous reflective learning in the context of technological advancement.  | Cognitive domain        | Create                      |
| PO4 | Effective Communication and social Interaction: To communicate effectively in terms of reading, writing, speaking and delivering the view to others.  | Cognitive domain        | Evaluate                    |
| PO5 | Ethics and Social Responsibility: To Exhibit professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems. | Cognitive domain        | Create                      |
| PO6 | Environment and Sustainability: To explain the importance of ecological balance along with conservation of natural resources for human wellbeing.   | Cognitive domain        | Apply                       |



| No.  | Program Specific Outcomes (PSOs)  | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain    |
|------|---|-------------------------|--------------------------------|
| PSO1 | Student will acquire knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity   | Cognitive domain        | Remember<br>Evaluate<br>Create |
| PSO2 | Students Improve reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.   | Cognitive domain        | Evaluate<br>Analyse            |
| PSO3 | Student will have a sound knowledge on computer application software and ability to design and develop applications for applicative problems.   | Cognitive domain        | Apply<br>Create                |
| PSO4 | Students will be able to exhibit effective writing as well as oral communication skills.  | Cognitive domain        | Understand<br>Analyse          |
| PSO5 | Students will have knowledge and understanding of norms and ethics in IT and allied industries.   | Cognitive domain        | Apply<br>Create                |
| PSO6 | Student will be able to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems. | Cognitive domain        | Apply<br>Create                |

**Mapping of POs & PSOs:**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|------|-----|-----|-----|-----|-----|-----|
| PSO1 | 2   | 1   | 3   | 3   | 1   | 1   |
| PSO2 | 2   | 3   | 2   | 2   | 1   | 3   |
| PSO3 | 3   | 3   | 3   | 2   | 2   | 3   |
| PSO4 | 2   | 2   | 2   | 2   | 2   | 2   |
| PSO5 | 1   | 2   | 0   | 1   | 3   | 2   |
| PSO6 | 2   | 1   | 2   | 2   | 3   | 2   |
| Avg. | 2   | 2   | 2   | 2   | 3   | 2   |

1: Slight (Low); 2: Moderate (Medium); 3: Substantial (High); 0 None



**Definition of Credit:**

|                                |            |
|--------------------------------|------------|
| 1 Hour. Lecture (L) per week   | 1 credit   |
| 1 Hour Tutorial (T) per week   | 1 credit   |
| 4 Hours Practical (P) per week | 2 credit   |
| 2 Hours Practical (P) per week | 1 credit   |
| 1 Hour Practical (P) per week  | 0.5 credit |
| 3 Hours Experiential learning  | 1 credit   |

**Course code Definitions:**

|   |      |
|---|------|
| Lecture   | L    |
| Tutorial  | T    |
| Practical   | P    |
| Basic Science Courses   | BSC  |
| Engineering Science Courses   | ESC  |
| Humanities and Social Sciences including Management courses               | HSMC |
| Professional core courses/Major (Core)                                    | PCC  |
| Professional Elective courses/Minor Stream                                | PEC  |
| Open Elective courses   | OEC  |
| Laboratory course   | LC   |
| Mandatory courses   | MC   |
| Non-credit courses  | NC   |
| Project (Experiential learning)   | PROJ |
| Experiential learning ex. Internship, Industrial Visit, Field visit, etc. | EL   |
| Multidisciplinary courses   | MDC  |
| Ability Enhancement Course  | AEC  |
| Skill Enhancement Course  | SEC  |
| Value Added Courses   | VAC  |

### Structure of Undergraduate Program:

| Sr. No. | Category  | Credit Breakup |
|---------|---|----------------|
| 1       | Humanities and Social Sciences including Management courses   | 4              |
| 2       | Basic Science courses   | 21             |
| 3       | Professional core courses   | 109            |
| 4       | Professional Elective courses relevant to chosen specialization/branch  | 3              |
| 6       | Project work, seminar and internship in industry or elsewhere   | 27             |
| 7       | Mandatory Courses [Environmental Sciences, Induction Programme, Indian Constitution, Essence of Indian Knowledge Tradition] | 12             |
| 8       | Skill Enhancement Compulsory/Elective Courses   | 12             |
|         | <b>Total</b>  | <b>188</b>     |

### Category-wise Courses:

#### Humanities & Social Sciences Courses

- i. Number of Humanities & Social Science Courses: 2
- ii. Credits: 4

| Sr. No. | Course Code | Course Name                     | Sem | Teaching Scheme (Hours/week) |   |   |       | Teaching Credit |   |   |       |
|---------|-------------|---------------------------------|-----|------------------------------|---|---|-------|-----------------|---|---|-------|
|         |             |                                 |     | L                            | P | T | Total | L               | P | T | Total |
| 1.      | AECC101     | Fundamentals of English         | I   | 2                            | 0 | 0 | 2     | 2               | 0 | 0 | 2     |
| 2.      | AECC201     | Communication Skills in English | II  | 2                            | 0 | 0 | 2     | 2               | 0 | 0 | 2     |
|         |             | <b>Total</b>                    |     | 4                            | 0 | 0 | 4     | 4               | 0 | 0 | 4     |

#### Note:

**L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Basic Science Course- Discipline Specific Generic Electives

- i. Number of Basic Science Course: 6
- ii. Credits: 20

| Sr. No.      | Course Code | Course Name                                    | Semester | Teaching Scheme (Hours/week) |   |   |       | Teaching Credit |   |   |       |
|--------------|-------------|--|----------|------------------------------|---|---|-------|-----------------|---|---|-------|
|              |             |  |          | L                            | P | T | Total | L               | P | T | Total |
| 1.           | BCCA104     | Statistics-I                                   | I        | 2                            | 0 | 1 | 3     | 2               | 0 | 1 | 3     |
| 2.           | BCCA204     | Discrete Mathematics for Computer Applications | II       | 3                            | 0 | 1 | 4     | 3               | 0 | 1 | 4     |
| 3.           | BCCA305     | Introduction to Numerical Methods              | III      | 2                            | 0 | 1 | 3     | 2               | 0 | 1 | 3     |
| 4.           | BCCA405     | Graph Theory                                   | IV       | 2                            | 0 | 1 | 3     | 2               | 0 | 1 | 3     |
| 5.           | BCCA505     | Operations Research                            | V        | 3                            | 0 | 0 | 3     | 3               | 0 | 0 | 3     |
| 6.           | BCCA704     | Statistics-II                                  | VII      | 3                            | 2 | 0 | 5     | 3               | 1 | 0 | 4     |
| <b>Total</b> |             |  |          | 15                           | 2 | 4 | 21    | 16              | 1 | 4 | 20    |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Professional Core Courses

- i. Number of Professional Core Courses: 31
- ii. Credits: 109

| Sr. No. | Course Code | Course Name                   | Semester | Teaching Scheme (Hours/week) |   |   |       | Teaching Credit |   |   |       |
|---------|-------------|-------------------------------|----------|------------------------------|---|---|-------|-----------------|---|---|-------|
|         |             |                               |          | L                            | P | T | Total | L               | P | T | Total |
| 1.      | BCCA101     | Fundamentals of Web designing | I        | 2                            | 2 | 0 | 4     | 2               | 1 | 0 | 3     |
| 2.      | BCCA102     | Digital Electronics           | I        | 2                            | 2 | 0 | 4     | 2               | 1 | 0 | 3     |
| 3.      | BCCA103     | Programming using C           | I        | 3                            | 2 | 0 | 5     | 3               | 1 | 0 | 4     |
| 4.      | BCCA201     | Front-end Programming         | II       | 2                            | 2 | 0 | 4     | 2               | 1 | 0 | 3     |



|     |         |   |     |   |   |   |   |   |   |   |   |
|-----|---------|---|-----|---|---|---|---|---|---|---|---|
| 5.  | BCCA202 | Systems' Analysis and Design            | II  | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 |
| 6.  | BCCA203 | Object-oriented Programming using C++   | II  | 3 | 2 | 0 | 5 | 3 | 1 | 0 | 4 |
| 7.  | BCCA205 | Programming Using Python                | II  | 1 | 2 | 0 | 3 | 1 | 1 | 0 | 2 |
| 8.  | BCCA301 | Database Management System              | III | 2 | 2 | 0 | 4 | 2 | 1 | 0 | 3 |
| 9.  | BCCA302 | Server side scripting                   | III | 3 | 2 | 0 | 5 | 3 | 1 | 0 | 4 |
| 10. | BCCA303 | Data Structure and Algorithm            | III | 3 | 2 | 0 | 5 | 3 | 1 | 0 | 4 |
| 11  | BCCA304 | Computer Network                        | III | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 2 |
| 12  | BCCA401 | Fundamentals of Operating Systems       | IV  | 2 | 2 | 0 | 4 | 2 | 1 | 0 | 3 |
| 13  | BCCA402 | Fundamentals of Information security    | IV  | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 2 |
| 14  | BCCA403 | Programming in JAVA                     | IV  | 3 | 2 | 0 | 5 | 3 | 1 | 0 | 4 |
| 15  | BCCA404 | Introduction to Artificial Intelligence | IV  | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 2 |
| 16  | BCCA405 | Software Engineering                    | V   | 4 | 0 | 0 | 4 | 4 | 0 | 0 | 4 |
| 17. | BCCA501 | Computer graphics                       | V   | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 |
| 18  | BCCA502 | Desktop Application Development         | V   | 2 | 2 | 0 | 4 | 2 | 1 | 0 | 3 |
| 19  | BCCA503 | Data Mining and Data Warehousing        | V   | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 |
| 20  | BCCA504 | Cloud Computing                         | V   | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 |
| 21  | BCCA504 | Introduction to Machine Learning        | V   | 2 | 2 | 0 | 4 | 2 | 1 | 0 |   |

|              |         |                                |      |           |           |          |            |           |           |          |            |
|--------------|---------|--------------------------------|------|-----------|-----------|----------|------------|-----------|-----------|----------|------------|
| 22           | BCCA601 | Server side web programming    | VI   | 2         | 2         | 0        | 4          | 2         | 1         | 0        | 3          |
| 23           | BCCA602 | Fundamentals of Data Science   | VI   | 3         | 0         | 0        | 3          | 3         | 0         | 0        | 3          |
| 24           | BCCA603 | Management Information System  | VI   | 3         | 0         | 0        | 3          | 3         | 0         | 0        | 3          |
| 25           | BCCA604 | System Software                | VI   | 3         | 0         | 0        | 3          | 3         | 0         | 0        | 3          |
| 26           | BCCA701 | LINUX Programming              | VII  | 4         | 2         | 0        | 6          | 4         | 1         | 0        | 5          |
| 27           | BCCA702 | Mobile Application Development | VII  | 4         | 2         | 0        | 6          | 4         | 1         | 0        | 5          |
| 28           | BCCA703 | Cloud Computing                | VII  | 5         | 2         | 0        | 7          | 5         | 1         | 0        | 6          |
| 29           | BCCA801 | Internet of Things             | VIII | 4         | 2         | 0        | 6          | 4         | 1         | 0        | 5          |
| 30           | BCCA802 | Multimedia Systems             | VIII | 5         | 0         | 0        | 5          | 5         | 0         | 0        | 5          |
| 31           | BCCA803 | Software Project Management    | VIII | 6         | 0         | 0        | 6          | 6         | 0         | 0        | 6          |
| <b>Total</b> |         |                                |      | <b>91</b> | <b>36</b> | <b>0</b> | <b>127</b> | <b>91</b> | <b>18</b> | <b>0</b> | <b>109</b> |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Professional Elective Courses-

- (i) Number of Professional Elective Course: 2  
(ii) Credits: 3

| Sr. No. | Course Code | Course Name     | Semester | Teaching Scheme (Hours/week) |   |   |       | Teaching Credit |   |   |       |
|---------|-------------|-----------------|----------|------------------------------|---|---|-------|-----------------|---|---|-------|
|         |             |                 |          | L                            | P | T | Total | L               | P | T | Total |
| 1.      | BCCA605     | Computer Vision | VI       | 3                            | 0 | 0 | 3     | 3               | 0 | 0 | 3     |
| 2.      | BCCA606     | Cloud Computing | VI       | 3                            | 0 | 0 | 3     | 3               | 0 | 0 |       |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Project Work, Seminar and Internship In Industry Or Elsewhere

- i. Number of Project Work, Seminar And Internship In Industry Or Elsewhere: 7
- ii. Credits: 27

| Sr. No. | Course Code | Course Name           | Semester | Teaching Scheme (Hours/week) |   |   |           | Teaching Credit |   |   |           |
|---------|-------------|-----------------------|----------|------------------------------|---|---|-----------|-----------------|---|---|-----------|
|         |             |                       |          | L                            | P | T | Total     | L               | P | T | Total     |
| 1.      | SECC201     | Industrial Internship | II       | 0                            | 0 | 0 | 2         | 0               | 0 | 0 | 2         |
| 2.      | SECC301     | Industrial Internship | III      | 0                            | 0 | 0 | 2         | 0               | 0 | 0 | 2         |
| 3.      | SECC401     | REEP                  | IV       | 0                            | 0 | 0 | 2         | 0               | 0 | 0 | 2         |
| 4.      | SECC501     | Industrial Internship | V        | 0                            | 0 | 0 | 2         | 0               | 0 | 0 | 2         |
| 5.      | SECC601     | Minor Project         | VI       | 0                            | 0 | 0 | 4         | 0               | 0 | 0 | 4         |
| 6.      | SECC701     | Industry Project      | VII      | 0                            | 0 | 0 | 5         | 0               | 0 | 0 | 5         |
| 7.      | SECC801     | Major Project         | VIII     | 0                            | 0 | 0 | 10        | 0               | 0 | 0 | 10        |
|         |             | <b>Total</b>          |          |                              |   |   | <b>27</b> |                 |   |   | <b>27</b> |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Ability Enhancement Courses

- i. Number of Ability Enhancement Courses: 6
- ii. Credits: 12

| Sr. No. | Course Code | Course Name                     | Semester | Teaching Scheme (Hours/week) |   |   |       | Teaching Credit |   |   |       |
|---------|-------------|---------------------------------|----------|------------------------------|---|---|-------|-----------------|---|---|-------|
|         |             |                                 |          | L                            | P | T | Total | L               | P | T | Total |
| 1.      | AECC101     | Fundamentals of English         | I        | 2                            | 0 | 0 | 2     | 2               | 0 | 0 | 2     |
| 2.      | AECC201     | Communication Skills in English | II       | 2                            | 0 | 0 | 2     | 2               | 0 | 0 | 2     |



|              |         |                              |     |           |   |   |           |           |   |   |           |
|--------------|---------|------------------------------|-----|-----------|---|---|-----------|-----------|---|---|-----------|
| 3.           | AECC301 | Indian Constitution          | III | 2         | 0 | 0 | 2         | 2         | 0 | 0 | 2         |
| 4.           | AECC401 | Environmental Science        | IV  | 2         | 0 | 0 | 2         | 2         | 0 | 0 | 2         |
| 5.           | AECC501 | Disaster Risk Management     | V   | 2         | 0 | 0 | 2         | 2         | 0 | 0 | 2         |
| 6.           | AECC601 | Entrepreneurship Development | VI  | 2         | 0 | 0 | 2         | 2         | 0 | 0 | 2         |
| <b>Total</b> |         |                              |     | <b>12</b> |   |   | <b>12</b> | <b>12</b> |   |   | <b>12</b> |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### Skill Enhancement Compulsory/Elective Courses

- i. Number of Skill Enhancement Courses: 5
- ii. Credits: 12

| Sr. No.      | Course Code | Course Name           | Semester | Teaching Scheme (Hours/week) |           |          |           | Teaching Credit |           |          |           |
|--------------|-------------|-----------------------|----------|------------------------------|-----------|----------|-----------|-----------------|-----------|----------|-----------|
|              |             |                       |          | L                            | P         | T        | Total     | L               | P         | T        | Total     |
| 1.           | SECC101     | Foundation Course     | I        | 0                            | 8         | 0        | 8         | 0               | 8         | 0        | 4         |
| 2.           | SECC201     | Industrial Internship | II       | 0                            | 2         | 0        | 2         | 0               | 2         | 0        | 2         |
| 3.           | SECC301     | Industrial Internship | III      | 0                            | 2         | 0        | 2         | 0               | 2         | 0        | 2         |
| 4.           | SECC401     | REEP                  | IV       | 0                            | 2         | 0        | 2         | 0               | 2         | 0        | 2         |
| 5.           | SECC501     | Industrial Internship | V        | 0                            | 2         | 0        | 2         | 0               | 2         | 0        | 2         |
| <b>Total</b> |             |                       |          | <b>0</b>                     | <b>16</b> | <b>0</b> | <b>16</b> | <b>0</b>        | <b>16</b> | <b>0</b> | <b>12</b> |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**

### **About the Program:**

The BCA program at the undergraduate level provides a solid foundation for students aspiring to build a successful career in the dynamic field of computer science and information technology. With a balanced curriculum, practical exposure, and a focus on both technical and soft skills, BCA graduates are prepared to meet the challenges of the ever-evolving IT industry. BCA graduates emerge from their academic journey with not only a deep understanding of programming languages, algorithms, and software development but also with the ability to apply this knowledge in real-world scenarios. The emphasis on hands-on projects, internships, and industry-relevant electives fosters a dynamic learning environment, preparing students to tackle the challenges and innovations that define the IT landscape. The BCA program opens doors to a myriad of career opportunities, with graduates well-positioned to contribute to various sectors of the IT industry. The program's relevance extends beyond the classroom, empowering students to embark on fulfilling careers in a technology-driven world.

# Semester - I

**Teaching Scheme**  
**Semester – I**

| Sr. No. | Course Code | Course Name                   | Teaching Scheme (Hours/week) |            |           |            | Teaching Credit |          |          |           | Evaluation Scheme |                   |                  |              |                 |             |
|---------|-------------|-------------------------------|------------------------------|------------|-----------|------------|-----------------|----------|----------|-----------|-------------------|-------------------|------------------|--------------|-----------------|-------------|
|         |             |                               | L                            | P          | T         | Total      | L               | P        | T        | Total     | Theory: MS Marks  | Theory: CEC Marks | Theory: ES Marks | Theory Marks | Practical Marks | Total Marks |
| 1       | BCCA101     | Fundamentals of Web designing | 30                           | 15         | 0         | 45         | 2               | 1        | 0        | 3         | 20                | 40                | 40               | 100          | 50              | 150         |
| 2       | BCCA102     | Digital Electronics           | 30                           | 15         | 0         | 45         | 2               | 1        | 0        | 3         | 20                | 40                | 40               | 100          | 50              | 150         |
| 3       | BCCA103     | Programming using C           | 45                           | 15         | 0         | 60         | 3               | 1        | 0        | 4         | 20                | 40                | 40               | 100          | 50              | 150         |
| 4       | BCCA104     | Statistics-I                  | 30                           | 0          | 15        | 45         | 2               | 0        | 1        | 3         | 20                | 40                | 40               | 100          | 0               | 100         |
| 5       | CBCS1XX     | CBCS Course                   | 30                           | 0          | 0         | 30         | 2               | 0        | 0        | 2         | 0                 | 0                 | 100              | 100          | 0               | 100         |
| 6       | AECC101     | Fundamentals of English       | 30                           | 0          | 0         | 30         | 2               | 0        | 0        | 2         | 20                | 40                | 40               | 100          | 0               | 100         |
| 7       | SECC104     | Internship                    | 0                            | 30         | 0         | 30         | 0               | 2        | 0        | 2         | 0                 | 0                 | 0                | 0            | 50              | 50          |
| 8       | VACC101     | Foundation Course             | 0                            | 30         | 0         | 30         | 0               | 4        | 0        | 4         | 0                 | 0                 | 0                | 0            | 50              | 50          |
|         |             | <b>Total</b>                  | <b>210</b>                   | <b>105</b> | <b>15</b> | <b>315</b> | <b>13</b>       | <b>7</b> | <b>1</b> | <b>22</b> | <b>100</b>        | <b>200</b>        | <b>300</b>       | <b>600</b>   | <b>250</b>      | <b>850</b>  |

Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester

**Summary of Credits:**

| <b>Sr. No.</b> | <b>Semester</b> | <b>Course Code</b> | <b>Course Name</b>            | <b>Theory marks</b> | <b>Practical marks</b> | <b>Course Credit</b> |
|----------------|-----------------|--------------------|-------------------------------|---------------------|------------------------|----------------------|
| 1              | I               | BCCA101            | Fundamentals of Web designing | 100                 | 50                     | 3                    |
| 2              | I               | BCCA102            | Digital Electronics           | 100                 | 50                     | 3                    |
| 3              | I               | BCCA103            | Programming using C           | 100                 | 50                     | 4                    |
| 4              | I               | BCCA104            | Statistics-I                  | 100                 | 0                      | 3                    |
| 5              | I               | CBCS1XX            | CBCS Course                   | 100                 | 0                      | 2                    |
| 6              | I               | AECC101            | Fundamentals of English       | 100                 | 0                      | 2                    |
| 7              | I               | VACC101            | Foundation Course             | 0                   | 50                     | 4                    |
|                |                 |                    | <b>Total</b>                  | <b>500</b>          | <b>250</b>             | <b>19</b>            |



**First Year**

|                               |  |                      |
|-------------------------------|--|----------------------|
| <b>COURSE CODE</b><br>BCCA101 | <b>COURSE NAME</b><br>Fundamentals of Web<br>Designing | <b>SEMESTER</b><br>I |
|-------------------------------|--|----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 30        | 0        | 60          | 2               | 1         | 0        | 3            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | None  |
| <b>Course Category</b>                             | Major   |
| <b>Course focus</b>                                | Employability   |
| <b>Rationale</b>                                   | The present course will equip students with the basic skills related to web designing and developing websites.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> the basic theoretical skills and practical experience required for entry into website development careers.<br>2: <b>Understand and Apply</b> a variety of the latest technologies to <b>create</b> responsive websites.<br>3: <b>Apply</b> the basic knowledge of how the web works, the technologies of HTML & CSS required to <b>create</b> presentable webpages.<br>4: <b>Develop</b> , host and maintain a website.<br>5. <b>Understand</b> the basic modern interactive web applications |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>UNIT-I Web Page Designing - I</b><br>Introduction, HTML tags, Structure of an HTML document, Text and Paragraph formatting, Ordered and Unordered lists - Nested Lists, Hyperlinks, Images    | 23%       | 7             |
| <b>UNIT-II Web Page Designing – II</b><br>Tables, Frames, Framesets - Nested Framesets, HTML Form & Form Elements  | 23%       | 7             |
| <b>UNIT-III Style Sheet</b><br>Introduction to Cascading Style Sheets (CSS), Ways of specifying styles, Basic Syntaxes, ID and CLASS selectors, SPAN, DIV, Font, Color, Background, Text, Border | 24%       | 7             |
| <b>UNIT-IV XML</b>   | 17%       | 5             |



|  |     |   |
|--|-----|---|
| XML overview & Syntax, Elements and Attributes, Namespaces, Schema, XSLT overview & Syntax   |     |   |
| <b>UNIT-V Responsive Web pages</b><br>Bootstrap Introduction, Installation, Using components | 13% | 4 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Practicals based on Basic formatting in HTML.                   | 10%       | 3             |
| 2. Practicals based on HTML Lists.                                 | 10%       | 3             |
| 3. Practicals based on HTML Images.                                | 5%        | 1             |
| 4. Practicals based on HTML Hyperlinks.                            | 5%        | 1             |
| 5. Practicals based on HTML Tables.                                | 15%       | 4             |
| 6. Practicals based on Frames and Framesets.                       | 5%        | 2             |
| 7. Practicals based on HTML Forms.                                 | 10%       | 5             |
| 8. Practicals based on basic CSS styling using various properties. | 10%       | 5             |
| 9. Practicals based on transforming XML using XSLT                 | 5%        | 2             |
| 10. Practicals based on Bootstrap.                                 | 5%        | 2             |
| 11. Practicing making complete single-page sites with styling      | 20%       | 2             |

**Instructional Method and Pedagogy:** Chalk-board, Demonstrations, Practical sessions, discussions, quizzes, online materials

| Course Outcome:  | Blooms' Taxonomy Domain                      | Blooms' Taxonomy Sub Domain         |
|--|--|-------------------------------------|
| After successful completion of the above course, students will be able to:         |  |                                     |
| CO1. <b>Develop</b> basic content of a Webpage using HTML.                         | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |
| CO2. Ability to <b>create</b> advanced components in a webpage/website using HTML. | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |
| CO3. <b>Demonstrate</b> content of a Webpage using CSS                             | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |



|   |                               |                             |
|---|-------------------------------|-----------------------------|
| CO4. <b>Apply</b> an alternative method to create and present a webpage using XML & XSLT. | Remember, Understand, analyse | Define, List, Explain, Use. |
| CO5. <b>Understanding</b> of the concepts of a responsive webpage using Bootstrap         | Remember, Understand          | Define, List, Explain, Use. |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Joel Sklar, Principle of Web Design, 2014, 5th Edition, Cengage Learning.</li> <li>David Flanagan, Javascript: The definitive Guide, 2011, 6th Edition, Oreilly Media.</li> <li>Alexis Goldstein, Louis Lazaris, Estelle Way, HTML5 and CSS3 for the Real World, 2015, SitePoint Pty Ltd.</li> <li>Douglas E Comer: The Internet, PHI, Second Edition, May 2000.</li> </ol> <p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>Xavier C: World Wide Web Design with HTML, Tata McGraw Hill Publication, 2000.</li> <li>Ivan Bayross, “Web Enabled Commercial Applications Development using HTML, DHTML, Javascript, Perl CGI”, BPB, 2004.</li> <li>Eric Meyer: Cascading Style Sheets – The Definitive Guide, O’Reilly – SPD, First Edition, 2000.</li> <li>Deitel, Nieto, Lin, Sadhu: “XML How to program”, Pearson Education, 2005.</li> </ol> |
| 2.                 | Journals & Periodicals:  |
| 3.                 | Other Electronic Resources:  |

| Evaluation Scheme                                    | Total Marks  |            |          |      |          |  |          |   |          |              |                 |
|--|--|------------|----------|------|----------|--|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |          |      |          |  |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |          |      |          |  |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment/Presentation / miscellaneous activities / Project</td> <td>15 marks</td> </tr> <tr> <td>Skill enhancement activities / case study / Lab Submissions</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment/Presentation / miscellaneous activities / Project | 15 marks | Skill enhancement activities / case study / Lab Submissions | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance   | 05 marks   |          |      |          |  |          |   |          |              |                 |
|  | MCQs   | 10 marks   |          |      |          |  |          |   |          |              |                 |
|  | Open Book Assignment/Presentation / miscellaneous activities / Project   | 15 marks   |          |      |          |  |          |   |          |              |                 |
|  | Skill enhancement activities / case study / Lab Submissions  | 10 marks   |          |      |          |  |          |   |          |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |      |          |  |          |   |          |              |                 |



|                        |                |                 |
|------------------------|----------------|-----------------|
| <b>Practical Marks</b> | Attendance     | 05 marks        |
|                        | Practical Exam | 20 marks        |
|                        | Viva           | 10 marks        |
|                        | Journal        | 10 marks        |
|                        | Discipline     | 05 marks        |
|                        | <b>Total</b>   | <b>50 Marks</b> |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 2    | 2    | 0    | 1    | 0    | 1    |
| CO2 | 1    | 2    | 0    | 2    | 1    | 0    |
| CO3 | 3    | 1    | 2    | 1    | 1    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 1    | 1    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 1    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |



|                                      |  |                             |
|--------------------------------------|--|-----------------------------|
| <b>COURSE CODE</b><br><b>BCCA102</b> | <b>COURSE NAME</b><br><b>Digital Electronics</b> | <b>SEMESTER</b><br><b>I</b> |
|--------------------------------------|--|-----------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 30        | 0        | 60          | 2               | 1         | 0        | 3            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Employability  |
| <b>Rationale</b>                                   | The present course will help students understand the basics of computer hardware and design of circuits.   |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> the basis of computer and its hardware.<br>2: <b>Formulation</b> of optimization models.<br>3: <b>Apply</b> knowledge on the working of the hardware part of the computer in terms of binary and<br>4: <b>Apply</b> to design combinational and sequential circuits<br>5: <b>Apply</b> to provide an exposure to commercial real time applications / tools / technologies. |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Computer Basics And Number System</b><br>Input/output Units:<br>Description of Computer Input Units, Other Input methods.<br>Computer Output Units-Introduction to Number system and Codes – Converting Numbers from One Base to Another –Different number systems and their conversions (Decimal, Binary, Octal, Hexadecimal), 9's and 10's complement, 1's and 2's complement. | 25%       | 8             |
| <b>Unit 2:Basic Gates</b><br>Integrated Circuits: Basic gates (AND, OR, NOT gates)<br>Universal gates (NAND and NOR gates) - other gates (XOR, XNOR gates).   | 15%       | 4             |
| <b>Unit 3: Boolean algebra and simplification techniques:</b><br>Boolean Algebra: Boolean identities, Basic laws of Boolean algebra- Properties of Boolean Algebra – Boolean Functions, DeMorgan's theorems, Boolean expressions for gate networks (SOP and POS), simplification of Boolean   | 30%       | 9             |



|   |     |   |
|---|-----|---|
| expression- Canonical and Standard forms -Karnaugh map – Don't care conditions – Tabulation Method.   |     |   |
| <b>Unit 4: Combinational Circuit</b><br>Combinational Logic – Adders- Subtractors (half and full)- Code Converter – Analyzing a Combinational Circuit –Multilevel NAND and NOR Circuits- Parallel binary adders- Decimal Adder- - Decoder,- Encoder,-Multiplexer- De-multiplexer with applications. | 15% | 5 |
| <b>Unit 5: Sequential Circuits:</b><br>Flip-Flops, Counters and Registers   | 15% | 4 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Study of Digital Number System & Its Significance                   | 7%        | 2             |
| 2. Study of Logic Gates (Buffer, AND, OR, NOT EXOR, EXNOR, NAND & NOR) | 7%        | 2             |
| 3. Study of Adder circuit  | 7%        | 2             |
| 4. Study of Subtrator circuit  | 7%        | 2             |
| 5. Study of Parity Bit Generator                                       | 13%       | 4             |
| 6. Study of Sequential logic & Flip Flops                              | 13%       | 4             |
| 7. Study of 4 Bit - Universal Shift Register                           | 7%        | 2             |
| 8. Study of Bi-Directional Counter                                     | 13%       | 4             |
| 9. Study of 8- Bit ADC (Analog to Digital Converter)                   | 13%       | 4             |
| 10. Study of CMOS Technology & Its Significance in Digital Electronics | 13%       | 4             |

**Instructional Method and Pedagogy:** Chalk-board, discussions, quizzes, online materials, Hands-on sessions

| Course Outcomes:  | Blooms' Taxonomy Domain     | Blooms' Taxonomy Sub Domain        |
|---|-----------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:  |                             |                                    |
| CO1. <b>Demonstrate</b> knowledge of the fundamental requirement of number systems including binary logic system. | Remember, Understand, Apply | Define, State, Discuss, Solve, Use |
| CO2. <b>Develop and understand</b> the working of the Boolean algebra and the operations of the                   | Apply                       | Solve, Use                         |



|   |                   |                               |
|---|-------------------|-------------------------------|
| logic gates   |                   |                               |
| CO3. <b>Analyze</b> the core logical concepts to meet the challenges in implementing the circuits                 | Apply, Analyze    | Solve, Use, Compare, Examine  |
| CO4. <b>Compute</b> response of simple sequential circuits with Flip-flops, Registers, Counters                   | Understand, Apply | Discuss, Classify, Solve, Use |
| CO5. <b>Understand</b> the basis requirement to design a system including memory, ALU and basis of microprocessor | Understand        | Discuss, Classify, Explain    |

| Learning Resources |   |
|--------------------|---|
| 1.                 | <b>Reference Books:</b><br>1. Scott Mueller, Upgrading and Repairing PCs, 2015, 22nd Edition, Que Publishing, Pearson Education Inc.<br>2. James K L, Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance, 2013, Eastern Economy Edition, PHI Learning Press.<br>3. Alan Clements, Principles of Computer Hardware, Oxford University Press, 2013, 4th Edition. |
| 2.                 | Journals & Periodicals:   |
| 3.                 | Other Electronic Resources:   |

| Evaluation Scheme                                    | Total Marks   |                 |          |                |          |                      |          |                |          |              |                 |
|--|---|-----------------|----------|----------------|----------|----------------------|----------|----------------|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks  |                 |          |                |          |                      |          |                |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks  |                 |          |                |          |                      |          |                |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance      | 05 marks | MCQs           | 10 marks | Open Book Assignment | 15 marks | Article Review | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance  | 05 marks        |          |                |          |                      |          |                |          |              |                 |
|  | MCQs  | 10 marks        |          |                |          |                      |          |                |          |              |                 |
|  | Open Book Assignment  | 15 marks        |          |                |          |                      |          |                |          |              |                 |
|  | Article Review  | 10 marks        |          |                |          |                      |          |                |          |              |                 |
|  | <b>Total</b>  | <b>40 Marks</b> |          |                |          |                      |          |                |          |              |                 |
| <b>Practical Marks</b>                               | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> </table>                       | Attendance      | 05 marks | Practical Exam | 20 marks | Viva                 | 10 marks | Journal        | 10 marks | Discipline   | 05 marks        |
|  | Attendance  | 05 marks        |          |                |          |                      |          |                |          |              |                 |
|  | Practical Exam  | 20 marks        |          |                |          |                      |          |                |          |              |                 |
|  | Viva  | 10 marks        |          |                |          |                      |          |                |          |              |                 |
|  | Journal   | 10 marks        |          |                |          |                      |          |                |          |              |                 |
| Discipline   | 05 marks  |                 |          |                |          |                      |          |                |          |              |                 |



|  |              |                 |
|--|--------------|-----------------|
|  | <b>Total</b> | <b>50 Marks</b> |
|--|--------------|-----------------|

**Mapping of PSOs & COs**

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 2    | 2    | 2    | 1    | 1    | 1    |
| CO2 | 1    | 2    | 3    | 2    | 1    | 1    |
| CO3 | 3    | 2    | 0    | 1    | 3    | 1    |
| CO4 | 2    | 1    | 3    | 2    | 1    | 0    |
| CO5 | 1    | 0    | 1    | 0    | 0    | 0    |

**Mapping of POs & COs**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 0   | 2   | 1   | 0   |
| CO2 | 2   | 2   | 2   | 1   | 1   | 0   |
| CO3 | 1   | 2   | 2   | 1   | 0   | 1   |
| CO4 | 0   | 1   | 1   | 0   | 0   | 0   |
| CO5 | 1   | 0   | 1   | 1   | 0   | 0   |



|                               |   |                      |
|-------------------------------|---|----------------------|
| <b>COURSE CODE</b><br>BCCA103 | <b>COURSE NAME</b><br>Programming using C | <b>SEMESTER</b><br>I |
|-------------------------------|---|----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 30        | 0        | 75          | 3               | 1         | 0        | 4            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Skill development  |
| <b>Rationale</b>                                   | Programming skills are necessary for accessing computers and other programmed machines either for modifying their core functioning and/or getting a task automated. Learning C programming can be a foundation stone for students opting for computer-based degree programs. It is essential due to its versatility, efficiency, and portability. It provides low-level control and high-level abstraction, making it suitable for a wide range of applications. C offers access to system-level functions, enabling interaction with hardware and development of performance-critical software. |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Provide</b> the basics of programming components.<br>2: <b>Develop</b> logics for array and string which will help them to create applications in C.<br>3: <b>Familiarise</b> students with functions and pointers.<br>4: Give <b>brief</b> idea about structures in c programming<br>5: gain <b>knowledge</b> about file handling using c language.  |



| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <p><b>Unit 1: INRODUCTION</b></p> <p>Introduction to programming paradigms Structure of C program -C programming: Data Types, Storage Classes, Constants, Enumeration Constants, Keywords, Operators, Precedence and Associativity, Expressions, Input / Output statements, Assignment statements, Decision making statements, control structure.</p>               | 20%       | 9             |
| <p><b>Unit 2: ARRAYS AND STRINGS</b></p> <p>Theory: Introduction to Arrays: Declaration, Initialization, One dimensional array, two dimensional arrays. Addition scaling determinant and Transpose, stein operation:- length, compare, concatenate, copy, bubble sort, linear and binary search.</p>  | 20%       | 9             |
| <p><b>Unit 3: FUNCTIONS AND POINTERS</b></p> <p><b>Theory:</b> Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions), Recursion, Pointer, pointer operators, Pointer arithmetic: Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference</p> | 20%       | 9             |
| <p><b>Unit 4: STRUCTURES</b></p> <p><b>Theory:</b> Structure: Nested structures, Pointer and Structures, Array of structures, Self-referential structures, typedef, Dynamic memory allocation: malloc, calloc, realloc, free().</p>   | 20%       | 9             |
| <p><b>Unit 5: FILE PROCESSING</b></p> <p><b>Theory:</b> Files and file handling operations, types of file processing: Sequential access, Random access, Sequential access file, Command line argument.</p>  | 20%       | 9             |



| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| <p>1:</p> <p>(1) Program to print “Hello GSFC University”.</p> <p>(2) Program to find the sum of the 2 numbers.</p> <p>(3) Program to find area and circumference of the circle.</p> <p>(4) Program to find simple interest.</p> <p>(5) Program to convert degree centigrade to Fahrenheit.</p> <p>(5) Program to calculate sum of 5 objects and print average.</p> <p>(6) Program to show swapping of 2 numbers without using the third variable.</p> <p>(7) Program to show swapping of 2 numbers using a third variable. B. Control Structures: IF, Switch, Loops</p> <p>(8) Program to show reverse of given number.</p> <p>(9) Program to find greatest among 3 numbers.</p> <p>(10) Repeat program10 with conditional operator.</p> <p>(11) Program to find that entered year is Leap year or not.</p> <p>(12) Program to find the given number is even or odd.</p> <p>(13) Program to use Switch statement, Display percentage of student.</p> <p>(14) Program to display arithmetic operations using Switch.</p> <p>(15) Program to display first 15 natural numbers and their sum using For Loop.</p> <p>(16) Program to print Patterns</p> <p>(17) Program to print Fibonacci series till 40.</p> <p>(18) Program to find factorial of given number.</p> <p>(19) Program to find whether a given number is prime or not.</p> | 20%       | 6             |
| <p>2:</p> <p>(20) Program to create an array of 10 elements. Show the sum and average of 10 elements entered by the user.</p> <p>(21) Program to find maximum number in given Array.</p> <p>(22) Program to display matrix.</p> <p>(23) Program to find sum of two Matrices.</p> <p>(24) Program to find subtraction of two matrices.</p> <p>(25) Program to find multiplication of two matrices.</p>  | 20%       | 6             |
| <p>3:</p> <p>(26) Program to find factorial of given number using function.</p> <p>(27) Program to show table of given number using function.</p> <p>(28) Program to show call by value.</p>   | 20%       | 6             |



|  |     |   |
|--|-----|---|
| <p>(29) Program to show call by reference. 36. Program to find the largest among two using functions.</p> <p>(30) Write a program to show how similar name variables can be used in different functions.</p> <p>(31) Write a program to return more than one value from a function.</p> <p>(32) Program for passing array from main function to display function.</p> <p>(33) Write a program in C to show the basic declaration of pointer.</p> <p>(34) Write a program in C to demonstrate how to handle the pointers in the program.</p> <p>(35) Write a program in C to demonstrate the use of &amp;(address of) and *(value at address) operator.</p> <p>(36) Write a program in C to add two numbers using pointers.</p> <p>(37) Write a program in C to add numbers using call by reference.</p> <p>(38) Write a program in C to store n elements in an array and print the elements using a pointer.</p> |     |   |
| <p>4:</p> <p>(38) Write a program to demonstrate declaration of structures.</p> <p>(39) Write a program to store student information using Structure.</p> <p>(40) Write a program to add two distances.</p> <p>(41) Write a program to store 10 student's information using structures.</p> <p>(42) Write a program to demonstrate nested structures.</p> <p>(43) Write a program to demonstrate how pointers will be used to create and access structure.</p>   | 20% | 6 |
| <p>5:</p> <p>(44) Write a program to create a file and store information.</p> <p>(45) Write a program to read contents from a file.</p> <p>(46) Write a program to append content at the end of file.</p>  | 20% | 6 |

**Instructional Method and Pedagogy:** Visual Aids and Demonstrations, Hands-On Approach, Active Learning Strategies, Real-World Examples, Project-Based Learning, Continuous Assessment

| Course Outcomes:  | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain |
|---|-------------------------|-----------------------------|
| After successful completion of the above course, students will be able to:                    | Cognitive Domain        |                             |
| CO1: Gain basic <b>understanding</b> of basic components of programming language.             |                         | Understand                  |
| CO2: <b>Understand</b> any other programming language with the knowledge of array and string. |                         | Understand                  |
| CO3: <b>Apply</b> function concepts in real time applications.                                |                         | Apply                       |
| CO4: <b>Analyse</b> working of structure in C or other programming language programs.         |                         | Analyse                     |
| CO5: Students will be able to <b>develop</b> applications using C Programming.                |                         | Apply                       |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <b>Reference Books:</b><br>1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie.<br>2. "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller.<br>3. "C The complete Reference" (4 <sup>th</sup> Ed) by Herbert Schildt. |
| 2.                 | Journals & Periodicals:<br>1. ACM Transactions on Programming Languages and Systems<br>2. IEEE Transactions on Software Engineering  |
| 3.                 | Other Electronic Resources:<br>1. <a href="https://www.gnu.org/software/libc/manual/">https://www.gnu.org/software/libc/manual/</a><br>2. <a href="https://www.learn-c.org/">https://www.learn-c.org/</a>  |

| Evaluation Scheme                 | Total Marks |
|-----------------------------------|-------------|
| <b>Theory: Mid semester Marks</b> | 20 marks    |
| <b>Theory: End Semester Marks</b> | 40 marks    |



|  |  |                 |
|--|--|-----------------|
| <b>Theory: Continuous Evaluation Component Marks</b> | Attendance   | 05 marks        |
|  | MCQs   | 10 marks        |
|  | Open Book Assignment/Presentation / miscellaneous activities / Project | 15 marks        |
|  | Skill enhancement activities / case study / Lab Submissions            | 10 marks        |
|  | <b>Total</b>   | <b>40 Marks</b> |
| <b>Practical Marks</b>                               | Attendance   | 05 marks        |
|  | Practical Exam   | 20 marks        |
|  | Viva   | 10 marks        |
|  | Journal  | 10 marks        |
|  | Discipline   | 05 marks        |
|  | <b>Total</b>   | <b>50 Marks</b> |

**Mapping of PSOs & COs**

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 1    | 0    | 1    | 1    |
| CO2 | 2    | 3    | 1    | 0    | 2    | 1    |
| CO3 | 2    | 1    | 1    | 2    | 2    | 0    |
| CO4 | 3    | 2    | 1    | 2    | 0    | 1    |
| CO5 | 1    | 0    | 0    | 0    | 0    | 0    |

**Mapping of POs & COs**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3   | 2   | 2   | 1   | 2   | 1   |
| CO2 | 2   | 1   | 1   | 0   | 2   | 0   |
| CO3 | 2   | 1   | 1   | 2   | 1   | 0   |
| CO4 | 0   | 2   | 1   | 2   | 0   | 1   |
| CO5 | 1   | 0   | 0   | 0   | 0   | 0   |



|                               |                                    |                      |
|-------------------------------|------------------------------------|----------------------|
| <b>COURSE CODE</b><br>BCCA104 | <b>COURSE NAME</b><br>Statistics-I | <b>SEMESTER</b><br>I |
|-------------------------------|------------------------------------|----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 0         | 15       | 60          | 2               | 0         | 1        | 3            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Minor  |
| <b>Course focus</b>                                | Skill development  |
| <b>Rationale</b>                                   | The present course will focus on introduction to statistics. It also provides the comprehensive knowledge of descriptive statistics and data collection and representation. It also delivers knowledge of Probability, its distribution functions and their statistics.  |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Remember, Understand</b> the meaning and scope of Statistical Applications.<br>2: <b>Understand</b> and <b>Use</b> the applications of statistics in the real-time problems.<br>3: <b>Apply</b> the comprehensive knowledge about the data collection, presentation of data, pictorial representation<br>4: <b>Remember, Understand and Apply</b> the measures of central tendency, measures of dispersion, control charts, correlation, regression, probability, and estimation on frequency distributions.<br>5: <b>Apply</b> the knowledge of probability distribution functions and their statistics. |

| <b>Course Content (Theory)</b>   | <b>Weightage</b> | <b>Contact hours</b> |
|--|------------------|----------------------|
| <b>Unit 1: Introduction to Statistics and Data Collection:</b><br>Importance of statistics, concepts of statistical population and a sample - Methods of Random and Non -Random Sampling - quantitative and qualitative data - Measurement scales - nominal, ordinal, interval and ratio - Primary and secondary data- Classification and tabulation of data. Diagrammatic and graphical representation of data-Histograms and Frequency Polygons. | 15%              | 9                    |



|   |     |    |
|---|-----|----|
| <b>Unit 2: Descriptive Statistics</b><br>Measures of Central tendency:- Mean, median and mode-<br>Measures of Dispersion:- Range, Quartile deviation,<br>Mean Deviation, Standard Deviation-The coefficient of<br>Variation, Skewness and Kurtosis  | 15% | 7  |
| <b>Unit 3: Correlation and Regression analysis</b><br>The Scatter Plot- Correlation-Types-Karl Pearsons<br>Coefficient of Correlation-Spearman's Rank Correlation<br>-Regression lines and coefficients- the coefficient of<br>Determination- Residuals-the standard error of Estimate  | 20% | 9  |
| <b>Unit 4: Theory of Probability</b><br>Probability, Random experiments, trial, sample space,<br>events. Approaches to probability - classical, empirical,<br>subjective and axiomatic. Theorems on probabilities of<br>events. Addition rule of probability. Conditional<br>probability, independence of events and multiplication<br>rule of probability. Bayes theorem and its applications. | 20% | 8  |
| <b>Unit 5: Random Variables and Distribution functions</b><br>Types of Random variables, probability distribution<br>functions, statistics for random variables, Binomial,<br>Poisson and Normal distribution functions   | 30% | 12 |

| List of Tutorials  | Weightage  | Contact hours |
|--|------------|---------------|
| <b>Unit 1:</b> Practice Examples based on sampling and data representation.                                | <b>12%</b> | <b>2</b>      |
| <b>Unit 2:</b> Practice Examples based on measurement of central tendency and dispersion.                  | <b>12%</b> | <b>2</b>      |
| <b>Unit 3:</b> Practice Examples on Coefficient of correlation, Rank correlation and Linear regression.    | <b>30%</b> | <b>4</b>      |
| <b>Unit 4:</b> Practice examples on Basic probability concepts, conditional probability and Bays' theorem. | <b>30%</b> | <b>4</b>      |
| <b>Unit 5:</b> Practice examples on statistics of Random variables and Probability distribution.           | <b>16%</b> | <b>3</b>      |

**Instructional Method and Pedagogy:** Chalk & board, group discussions, assignments, statistical tools (MS office), Online materials, Real-life case studies examples

| Course Outcomes:  | Blooms' Taxonomy Domain         | Blooms' Taxonomy Sub Domain                         |
|---|---------------------------------|---|
| After successful completion of the above course, students will be able to:          |                                 |   |
| CO1. <b>Organize</b> , present and interpret statistical data, both numerically and | Remember,<br>Understand, Apply, | Define, State, classify,<br>Explain, Identify, Use, |



|  |                            |  |
|--|----------------------------|--|
| graphically  | Analyze                    | Solve, Organize, Examine                                   |
| CO2. Use the concepts of Measure the central tendency and dispersion for give data   | Understand, Apply          | Describe, Identify, Solve, Use, Find                       |
| CO3. Apply regression analysis, compute and interpret the coefficient of correlation | Understand, Apply, Analyze | classify, Explain, Identify, Use, Solve, Organize, Examine |
| CO4. Apply various methods to compute the probabilities of events.                   | Understand, Apply, Analyze | classify, Explain, Identify, Use, Solve, Organize, Examine |
| CO5. Use appropriate probability distribution to Calculate the probabilistic value   | Understand, Apply, Analyze | classify, Explain, Identify, Use, Solve, Organize, Examine |

| Learning Resources |   |
|--------------------|---|
| 1.                 | <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>S. P. Gupta, 2014, Business Statistics and Statistical Methods, S. Chand Publication, New Delhi</li> <li>Goon, Gupta and Dasgupta – Fundamentals of Statistics, Vol. 1 (2005), The world press Pvt. Ltd, Kolkata</li> <li>Rohatgi V.K. (2001): An introduction to probability theory and mathematical statistics. – A wiley inter science publications</li> <li>Feller : An introduction to probability theory and its applications, vol-I – Asia Publishing house</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Gould et al (2017): Essential Statistics – Exploring the world through data, 2e, Pearson.</li> <li>L. Mayes &amp; Keying, (2005), Probability Statistics for Engineers and Scientists, Pearson Education.</li> <li>Nolan and Speed (2000): Stat Labs – Mathematical Statistics through Applications, Springer</li> <li>Gangoilli and Ylvisaker : Discrete Probability – Harcourt Brace Jovanorich Inc</li> </ol> |
| 2.                 | Journals & Periodicals:   |
| 3.                 | <p>Other Electronic Resources:</p> <ol style="list-style-type: none"> <li><a href="http://www.onlinestatbook.com">www.onlinestatbook.com</a></li> <li><a href="https://statisticsbyjim.com/">https://statisticsbyjim.com/</a></li> </ol>  |

| Evaluation Scheme  | Total Marks  |            |          |      |          |                      |          |  |          |              |                 |
|--|--|------------|----------|------|----------|----------------------|----------|--|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                                    | 20 marks   |            |          |      |          |                      |          |  |          |              |                 |
| <b>Theory: End Semester Marks</b>                                    | 40 marks   |            |          |      |          |                      |          |  |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b>                 | <table border="1"> <tbody> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement activities / Practice Assignments</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </tbody> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement activities / Practice Assignments | 10 marks | <b>Total</b> | <b>40 Marks</b> |
| Attendance   | 05 marks   |            |          |      |          |                      |          |  |          |              |                 |
| MCQs   | 10 marks   |            |          |      |          |                      |          |  |          |              |                 |
| Open Book Assignment   | 15 marks   |            |          |      |          |                      |          |  |          |              |                 |
| Article Review / Skill enhancement activities / Practice Assignments | 10 marks   |            |          |      |          |                      |          |  |          |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |      |          |                      |          |  |          |              |                 |

#### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 2    | 0    | 2    | 1    |
| CO2 | 2    | 1    | 1    | 0    | 2    | 0    |
| CO3 | 2    | 2    | 2    | 2    | 1    | 0    |
| CO4 | 2    | 2    | 1    | 1    | 0    | 1    |
| CO5 | 1    | 0    | 1    | 0    | 0    | 0    |

#### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 1   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |



|                               |   |                      |
|-------------------------------|---|----------------------|
| <b>COURSE CODE</b><br>AECC101 | <b>COURSE NAME</b><br>Fundamentals of English | <b>SEMESTER</b><br>I |
|-------------------------------|---|----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |   |
|--|---|
| <b>Course Prerequisites</b>                        | Student should have cleared 12th Science  |
| <b>Course Category</b>                             | Ability Enhancement course  |
| <b>Course focus</b>                                | Skills Development  |
| <b>Rationale</b>                                   | English is recognized as the most widely spoken language around the World. It serves as a common language for international Communication, business, diplomacy, and tourism. By studying English, individuals gain the ability to connect with people from diverse cultures and backgrounds, facilitating effective global Communication.   |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: To emphasize the development of listening and reading skills among learners<br>2: To equip them with writing skills needed for academic as well as workplace context<br>3: To enable learners of Engineering and Technology develop their basic communication skills in English<br>4. To strengthen the fundamentals in English Language.<br>5. To build up the confidence to communicate with the world. |

| Course Content (Theory)  | Weightage  | Contact hours |
|--|------------|---------------|
| <b>Unit 1:Language Basics</b><br>Parts of speech, word formation, prefix-suffix, synonyms, antonyms, homophones and standard abbreviations   | <b>20%</b> | 6             |
| <b>Unit 2:Elementary Reading/Writing Skills</b><br>Types of the sentences, structures of the sentences, use of phrases and clauses, punctuation, creative writing and coherence, comprehension, essay, paragraph writing, creative writing | <b>30%</b> | 9             |
| <b>Unit 3: Elementary Spoken Skills</b><br>Greetings, farewell and introduction, making an apology, accepting an apology, making an appointment, JAM   | <b>20%</b> | 6             |



|  |            |   |
|--|------------|---|
| <b>Unit 4: Presentation Skills</b><br>Group Discussion, Debate, Public Speaking, Discussion on a specific purpose.   | <b>10%</b> | 3 |
| <b>Unit 5: Practicing and Identifying the Common Error</b><br>Tense, subject-verb agreement, noun-pronoun agreement, articles, prepositions, modal auxiliaries, voice, reported speech | <b>20%</b> | 6 |

**Instructional Method and Pedagogy:** Classroom Lecture, Case Studies, Quizzes, Presentations, Role Play, Expert Lecture (Consultant)

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b>       |
|--|--------------------------------|--|
| After successful completion of the above course, students will be able to:                                   |                                |  |
| CO1: To emphasize the development of listening and reading skills among learners                             | Understand, Analyse, Remember  | Define, Classify & Demonstrate           |
| CO2: To equip them with writing skills needed for academic as well as workplace context                      | Analyse, Apply, Understand     | Classify, Describe & Demonstrate         |
| CO3: To enable learners of Engineering and Technology to develop their basic communication skills in English | Understand, remember           | Define, Describe & Demonstrate           |
| CO4: To strengthen the fundamentals in English Language.   | Remember, Analyse              | Define Describe                          |
| CO5: To build up the confidence to communicate with the world.   | Understand, Apply              | Define, Classify, Describe & Demonstrate |

| <b>Learning Resources</b> |  |
|---------------------------|--|
| 1.                        | <p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>Murphy, Raymond "Murphy's English Grammar with CD" Cambridge University Press, 2004. .</li> <li>Thorpe, Edgar and Showick Thorpe "Basic Vocabulary" Pearson Education India, 2012.</li> <li>Green, David. "Contemporary English Grammar Structures and Composition" MacMillan Publishers, New Delhi, 2010.</li> <li>Wren &amp; Martin (2001), English Grammar &amp; Composition, New York</li> </ol> |
| 2.                        | <p><b>Journals:</b></p> <ol style="list-style-type: none"> <li>The Journal' Basic English Grammar</li> <li>Fluent U' English Language and Cultural Journal</li> <li>The Journal of English Academics'</li> </ol>   |

|    |   |
|----|---|
|    | 4. Elsevier' The research on language<br><b>Periodicals:</b><br>1. Index Noedicus : A Cumulative Index to English Language Periodicals<br>2. The Illustrated English Language Periodicals |
| 3. | <b>Other Electronic Resources:</b><br>Google classroom, Google form Wordsworth - Language software,<br>Jam board.   |

| Evaluation Scheme                                     | Total Marks  |            |          |      |          |                      |          |   |          |              |                 |
|---|--|------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                     | 20 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                     | 40 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b>  | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
| Attendance  | 05 marks   |            |          |      |          |                      |          |   |          |              |                 |
| MCQs  | 10 marks   |            |          |      |          |                      |          |   |          |              |                 |
| Open Book Assignment                                  | 15 marks   |            |          |      |          |                      |          |   |          |              |                 |
| Article Review / Skill enhancement related activities | 10 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Total</b>  | <b>40 Marks</b>  |            |          |      |          |                      |          |   |          |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 0    | 2    | 1    |
| CO2 | 2    | 1    | 1    | 0    | 0    | 0    |
| CO3 | 2    | 2    | 0    | 2    | 1    | 0    |
| CO4 | 0    | 2    | 1    | 1    | 0    | 1    |
| CO5 | 1    | 0    | 1    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 1   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 1   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

# Semester - II

**Teaching Scheme**  
**Semester – II**

| Sr .<br>N<br>o. | Course<br>Code | Course Name                           | Teaching Scheme<br>(Hours/week) |           |           |            | Teaching Credit |          |          |           | Evaluation Scheme           |                                 |                             |                         |                            |                    |
|-----------------|----------------|---------------------------------------|---------------------------------|-----------|-----------|------------|-----------------|----------|----------|-----------|-----------------------------|---------------------------------|-----------------------------|-------------------------|----------------------------|--------------------|
|                 |                |                                       | L                               | P         | T         | Total      | L               | P        | T        | Total     | Theor<br>y: MS<br>Mark<br>s | Theor<br>y:<br>CEC<br>Mark<br>s | Theor<br>y: ES<br>Mark<br>s | Theor<br>y<br>Mark<br>s | Practi<br>cal<br>Mark<br>s | Total<br>Mark<br>s |
| 1               | BCCA201        | Mathematical Foundation for CS        | 30                              | 15        | 0         | 45         | 2               | 1        | 0        | 3         | 20                          | 40                              | 40                          | 100                     | 50                         | 150                |
| 2               | BCCA202        | System Analysis & Design              | 45                              | 0         | 0         | 45         | 3               | 0        | 0        | 3         | 20                          | 40                              | 40                          | 100                     | 0                          | 100                |
| 3               | BCCA203        | Object Oriented Programming using C++ | 45                              | 15        | 0         | 60         | 3               | 1        | 0        | 4         | 20                          | 40                              | 40                          | 100                     | 50                         | 150                |
| 4               | BCCA204        | Web Technologies                      | 15                              | 15        | 0         | 30         | 1               | 1        | 0        | 2         | 20                          | 40                              | 40                          | 100                     | 50                         | 150                |
| 5               | BCCA205        | Data Structure                        | 45                              | 0         | 15        | 60         | 3               | 0        | 1        | 4         | 20                          | 40                              | 40                          | 100                     | 0                          | 100                |
| 6               | VACC201        | Tinkering & Mentoring                 | 30                              | 0         | 0         | 30         | 2               | 0        | 0        | 2         | 20                          | 40                              | 40                          | 100                     | 0                          | 100                |
| 7               | AECC201        | Communication Skills in English       | 30                              | 0         | 0         | 30         | 2               | 0        | 0        | 2         | 20                          | 40                              | 40                          | 100                     | 0                          | 100                |
| 8               | SECC201        | Internship                            | 0                               | 30        | 0         | 30         | 0               | 2        | 0        | 2         | 0                           | 0                               | 0                           | 0                       | 50                         | 50                 |
|                 |                | <b>Total</b>                          | <b>270</b>                      | <b>75</b> | <b>15</b> | <b>360</b> | <b>18</b>       | <b>5</b> | <b>1</b> | <b>24</b> | <b>160</b>                  | <b>320</b>                      | <b>320</b>                  | <b>800</b>              | <b>200</b>                 | <b>1000</b>        |

Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester

**Summary of Credits:**

| <b>Sr. No .</b> | <b>Sem ester</b> | <b>Course Code</b> | <b>Course Name</b>                    | <b>Theor y marks</b> | <b>Practic al marks</b> | <b>Cours e Credit</b> |
|-----------------|------------------|--------------------|---------------------------------------|----------------------|-------------------------|-----------------------|
| 1               | II               | BCCA201            | Mathematical Foundation for CS        | 100                  | 50                      | 3                     |
| 2               | II               | BCCA202            | System Analysis & Design              | 100                  | 0                       | 3                     |
| 3               | II               | BCCA203            | Object Oriented Programming using C++ | 100                  | 50                      | 4                     |
| 4               | II               | BCCA204            | Web Technologies                      | 100                  | 50                      | 2                     |
| 5               | II               | BCCA205            | Data Structure                        | 100                  | 0                       | 4                     |
| 6               | II               | VACC201            | Tinkering & Mentoring                 | 100                  | 0                       | 2                     |
| 7               | II               | AECC201            | Communication Skills in English       | 100                  | 0                       | 2                     |
| 8               | II               | SECC201            | Internship                            | 0                    | 50                      | 2                     |
|                 |                  |                    |                                       |                      |                         |                       |
|                 |                  |                    | <b>Total</b>                          | <b>700</b>           | <b>200</b>              | <b>22</b>             |



|                               |  |                                 |
|-------------------------------|--|---------------------------------|
| <b>COURSE CODE</b><br>BCCA201 | <b>COURSE NAME</b><br>Mathematics Foundation to Computer Science - I | <b>SEMESTER</b><br>IIFirst Year |
|-------------------------------|--|---------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 15       | 45          | 2               | 0         | 1        | 3            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Employability  |
| <b>Rationale</b>                                   | To integrate fundamental concepts of mathematics, including set theory, relations, functions, counting techniques, matrix algebra, and recurrence relations, to develop logical thinking, problem-solving, and analytical skills. These topics are essential for applications in computer science, engineering, and data science, enhancing students' ability to solve real-world mathematical problems effectively.   |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>To Understand</b> fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.<br>2: This course enables the students to use mathematical models and techniques <b>to analyze and understand</b> problems in computer science.<br>3: <b>To demonstrate</b> how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze. |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Set and Relations</b><br>Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products. Relations on a Set, Properties of Relations, Representing Types of Relations, | 20%       | 6             |

|   |     |   |
|---|-----|---|
| Equivalence Relation, Equivalence relation and partition on set   |     |   |
| <b>Unit 2: Functions and Counting</b><br>Functions, properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to-one) and bijective functions, inverse of functions. Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.<br>Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem. | 20% | 6 |
| <b>Unit 3: Recurrence Relation</b><br>Recurrence relations, modeling recurrence relations with examples, like Fibonacci numbers Solving linear recurrence relation with constant coefficients using characteristic equation roots method.   | 20% | 6 |
| <b>Unit 4: Matrix Algebra:</b><br>Types of matrices, algebra of matrices–addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, rank of a matrix, inverse of a matrix   | 20% | 6 |
| <b>Unit 5: Applications of Matrices</b><br>applications of matrices to solve system of linear equations, Eigen values and Eigen vectors   | 20% | 6 |

| List Of Practical | Weightage | Contact hours |
|-------------------|-----------|---------------|
| --NA--            |           |               |

**Instructional Method and Pedagogy:** The instructional method will include lectures, interactive discussions, and problem-solving sessions. Visual aids such as diagrams, Venn diagrams, and matrix representations will be used to enhance understanding. Practical examples, real-life applications, and case studies will be incorporated to facilitate application-based learning. Additionally, assignments and quizzes will be conducted for continuous assessment and reinforcement of concepts

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b>          | <b>Blooms' Taxonomy Sub Domain</b>       |
|--|---|--|
| After successful completion of the above course, students will be able to:   |   |  |
| CO1: <b>Understand</b> the concepts of sets and relations, and <b>apply</b> them to represent relationships using matrices and graphs effectively.             | <b>Understand, &amp; Apply</b>          | Define, Solve, Find, Describe, Construct |
| CO2: <b>Apply</b> the properties of functions and counting techniques, such as permutations and combinations, <b>to solve</b> practical mathematical problems. | <b>Understand, Analyze &amp; Apply</b>  | Apply, calculate Analyze                 |
| CO3: <b>Analyze</b> recurrence relations and develop models <b>to solve</b> problems like the Fibonacci sequence   | <b>Understand, Analyze &amp; Apply</b>  | Determine, find. formulate, solve        |
| CO4: <b>Evaluate</b> matrix properties and <b>perform</b> operations like addition, multiplication, and inversion to solve algebraic equations.                | <b>Understand, Evaluate &amp; Apply</b> | Evaluate, Apply, Calculate, Find         |
| CO5: <b>Apply</b> matrix concepts to solve systems of linear equations and interpret the significance of eigenvalues and eigenvectors in practical contexts.   | <b>Analyze &amp; Apply</b>              | Use, solve Compute, Determine            |

| <b>Learning Resources</b> |   |
|---------------------------|---|
| 1.                        | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>Garg, Reena, Engineering Mathematics, Khanna Book Publishing Company, 2024.(AICTE Recommended Textbook)</li> <li>Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company,2023.</li> <li>Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.</li> <li>Vasishtha A. R. and Vasishtha A. K., Matrices, Krishna Prakashan, 2022.</li> <li>Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019</li> </ol> |
| 2.                        | Journals & Periodicals:   |
| 3.                        | Other Electronic Resources: <ol style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/106103205">https://nptel.ac.in/courses/106103205</a></li> <li><a href="https://nptel.ac.in/courses/111101115">https://nptel.ac.in/courses/111101115</a></li> </ol>  |



| <b>Evaluation Scheme</b>  | <b>Total Marks</b>   |            |          |                |          |   |          |  |          |              |                 |              |                 |
|---|--|------------|----------|----------------|----------|---|----------|--|----------|--------------|-----------------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                                     | 20 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| <b>Theory: End Semester Marks</b>                                     | 40 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b>                  | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment / Skill enhancement activities / Lab Submissions</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Presentation / miscellaneous activities / Project</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs           | 10 marks | Open Book Assignment / Skill enhancement activities / Lab Submissions | 15 marks | Article Review / Presentation / miscellaneous activities / Project | 10 marks | <b>Total</b> | <b>40 Marks</b> |              |                 |
| Attendance  | 05 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| MCQs  | 10 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Open Book Assignment / Skill enhancement activities / Lab Submissions | 15 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Article Review / Presentation / miscellaneous activities / Project    | 10 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| <b>Total</b>  | <b>40 Marks</b>  |            |          |                |          |   |          |  |          |              |                 |              |                 |
| <b>Practical Marks</b>  | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>50 Marks</b></td> </tr> </table>  | Attendance | 05 marks | Practical Exam | 20 marks | Viva  | 10 marks | Journal  | 10 marks | Discipline   | 05 marks        | <b>Total</b> | <b>50 Marks</b> |
| Attendance  | 05 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Practical Exam  | 20 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Viva  | 10 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Journal   | 10 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| Discipline  | 05 marks   |            |          |                |          |   |          |  |          |              |                 |              |                 |
| <b>Total</b>  | <b>50 Marks</b>  |            |          |                |          |   |          |  |          |              |                 |              |                 |



### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 3    | 0    | 0    | 2    |
| CO2 | 2    | 0    | 3    | 0    | 0    | 0    |
| CO3 | 3    | 1    | 2    | 0    | 0    | 0    |
| CO4 | 3    | 0    | 2    | 2    | 0    | 3    |
| CO5 | 2    | 0    | 3    | 2    | 0    | 2    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3   | 0   | 0   | 0   | 0   | 3   |
| CO2 | 3   | 3   | 3   | 1   | 1   | 3   |
| CO3 | 3   | 1   | 2   | 0   | 0   | 3   |
| CO4 | 3   | 2   | 3   | 2   | 3   | 3   |
| CO5 | 3   | 2   | 1   | 0   | 3   | 3   |



|                               |  |                       |
|-------------------------------|--|-----------------------|
| <b>COURSE CODE</b><br>BCCA202 | <b>COURSE NAME</b><br>System Analysis and Design | <b>SEMESTER</b><br>II |
|-------------------------------|--|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 0         | 0        | 45          | 3               | 0         | 0        | 3            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Employability  |
| <b>Rationale</b>                                   | The present course will help students understand about the system design and analysis and their components. Also they learn different life cycles and frameworks of the system.  |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | <p>To enable the student to:</p> <ol style="list-style-type: none"> <li><b>Understand</b> the concepts of systems and its components.</li> <li><b>Understand</b> and learn the different phases of Systems Development Life Cycle (SDLC).</li> <li>Learn and <b>analyse</b> systems design techniques, methodologies, and tools.</li> <li><b>Understand</b> the framework of SSADM (Structured System Analysis and Design Method) with its features.</li> <li><b>Understand</b> Input/output design and fact gathering techniques and to construct DFDs (Data Flow Diagrams).</li> </ol> |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>Unit 1: Basic System Concepts</b><br>The concept of a System, The Elements and Characteristics of a System, Types of Systems, Meaning of Systems Analysis, Role of a Systems Analyst, What is System Design, Comparison between System Analysis and System Design | 20%       | 6             |
| <b>Unit 2: System Development Life Cycle (SDLC)</b><br>Stages of Systems Analysis - Problem Identification, Feasibility Study and Cost Benefit Analysis, System Requirement Analysis   | 20%       | 6             |



|  |     |   |
|--|-----|---|
| Stages of Systems Design - System Design Specification and Programming, System Implementation, Follow up, Maintenance, Testing and Evaluation of a System  |     |   |
| <b>Unit 3: Structured System Analysis and Design method (SSADM)</b><br>Structured Systems Analysis and Design (SSADM) – Need, Meaning<br>SSADM Methodology: System Survey, Structured Analysis, Structured Design, Hardware study, System Implementation, Maintenance, Advantages of SSADM                     | 20% | 6 |
| <b>Unit 4: Fact Finding Techniques and Input / Output Design</b><br>Fact Finding Techniques - Introduction, need, types<br>Data Capture - Introduction, Objectives, Steps, Data verification and validation<br>Output Design - Design Principles, Output objectives, Types of Output, Various forms of Outputs | 20% | 6 |
| <b>Unit 5: Data Flow analysis methods</b><br>Data Flow Diagrams (DFDs) - Meaning, Significance, Symbols used in DFDs, Rules for Constructing DFDs<br>Decision Table and Decision Tree, Structured English, Data Dictionary   | 20% | 6 |

**Instructional Method and Pedagogy:** Chalk-board, discussions, quizzes, online materials

| <b>Course Outcomes:</b>   | <b>Blooms' Taxonomy Domain</b>               | <b>Blooms' Taxonomy Sub Domain</b> |
|---|--|------------------------------------|
| After successful completion of the above course, students will be able to:  |  |                                    |
| CO1: <b>Understand</b> the concepts of System, System Analysis and System Design                                  | Remember, Understand                         | Define, List, Explain, Use.        |
| CO2: get the <b>understanding</b> of the System Development Life Cycle (SDLC) methodology                         | Remember, Understand                         | Define, List, Explain, Use.        |
| CO3: get the <b>understanding</b> the Structured System Analysis and Design method (SSADM).                       | Remember, Understand                         | Define, List, Explain, Use.        |
| CO4: Learn the various Fact Finding techniques & develop an understanding to <b>create</b> Input / Output Designs | Remember, Understand, analyse, apply, create | Define, List, Explain, Use, Design |
| CO5: <b>Design and use</b> Data Flow Diagrams and Decision-making methods.  | Remember, Understand,                        | Define, List, Explain, Use,        |



|  |                        |        |
|--|------------------------|--------|
|  | analyse, apply, create | Design |
|--|------------------------|--------|

| Learning Resources |   |
|--------------------|---|
| 1.                 | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Elias M. Awad, System Analysis and Design, Latest Edition.</li> <li>V. Rajaraman – Analysis &amp; Design of I. S. Prentice Hall of India Private Ltd.2003.</li> <li>Perry Edwards, System Analysis &amp; design, McGraw Hill, Latest Edition.</li> </ol> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>S. Parthasarthy&amp; B. W. Khalkar : System Analysis &amp; Design, 1st Edition, Master Ed. Cons., Nashik.</li> <li>James A. Senn : Analysis &amp; Design of Information System 2nd Edition, McGraw-Hill Int.</li> </ol> |
| 2.                 | Journals & Periodicals:   |
| 3.                 | Other Electronic Resources:   |

| Evaluation Scheme   | Total Marks  |            |          |      |          |  |          |   |          |              |                 |
|---|--|------------|----------|------|----------|--|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                                 | 20 marks   |            |          |      |          |  |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                                 | 40 marks   |            |          |      |          |  |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b>              | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment / Skill enhancement activities / case study</td> <td>10 marks</td> </tr> <tr> <td>Article Review /Presentation/ miscellaneous activities / Projects</td> <td>15 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment / Skill enhancement activities / case study | 10 marks | Article Review /Presentation/ miscellaneous activities / Projects | 15 marks | <b>Total</b> | <b>40 Marks</b> |
| Attendance  | 05 marks   |            |          |      |          |  |          |   |          |              |                 |
| MCQs  | 10 marks   |            |          |      |          |  |          |   |          |              |                 |
| Open Book Assignment / Skill enhancement activities / case study  | 10 marks   |            |          |      |          |  |          |   |          |              |                 |
| Article Review /Presentation/ miscellaneous activities / Projects | 15 marks   |            |          |      |          |  |          |   |          |              |                 |
| <b>Total</b>  | <b>40 Marks</b>  |            |          |      |          |  |          |   |          |              |                 |



### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 3    | 1    | 0    | 0    |
| CO2 | 2    | 2    | 3    | 2    | 1    | 1    |
| CO3 | 2    | 2    | 1    | 1    | 1    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 1    | 1    |
| CO5 | 0    | 1    | 0    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 0   | 2   | 1   | 1   | 0   |
| CO3 | 2   | 1   | 1   | 1   | 1   | 1   |
| CO4 | 1   | 2   | 1   | 1   | 0   | 1   |
| CO5 | 0   | 0   | 1   | 1   | 0   | 0   |

---



|                               |   |                       |
|-------------------------------|---|-----------------------|
| <b>COURSE CODE</b><br>BCCA203 | <b>COURSE NAME</b><br>Object Oriented Programming using C++ | <b>SEMESTER</b><br>II |
|-------------------------------|---|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 30        | 0        | 75          | 3               | 1         | 0        | 4            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | None  |
| <b>Course Category</b>                             | Major   |
| <b>Course focus</b>                                | Employability   |
| <b>Rationale</b>                                   | The present course will focus on fundamentals of programming concepts of C++.   |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> the basic concepts of Object Oriented Programming using C++.<br>2: <b>Understand the fundamentals of</b> input/output, arrays<br>3: <b>Understand the fundamentals of</b> working with classes.<br>4: <b>Define and create</b> the functions, and <b>understand</b> the function overloading and inheritance.<br>5: <b>Understand</b> the concepts of operator overloading, pointers and files. |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Object Oriented Programming (OOP) Concepts and Introduction to C++</b><br>– Structured programming vs. object oriented programming<br>– Basic OOP concepts : objects, classes, encapsulation, data hiding, inheritance, polymorphism<br>– Introduction to C++: structure of a C++ program, data types, variables, constants, expressions, statements and operators<br>– Usage of header files<br>– Control flow statements: if else, for loop, while loop, do while loop, switch, break and continue | 15%       | 6             |
| <b>Unit 2: Input/Output, Arrays, Strings</b><br>– Basic I/O in C++<br>– Arrays in C++ : introduction, declaration, initialization   | 18%       | 12            |



|  |     |    |
|--|-----|----|
| of one , two and multi-dimensional arrays, operations on arrays<br>– Working with strings : introduction, declaration, string manipulation and arrays of strings   |     |    |
| <b>Unit 3: Classes</b><br>– Classes and objects in C++<br>– Constructors : default, parameterized, copy, constructor overloading and destructors<br>– Access specifiers, implementing and accessing class members<br>– Working with objects : constant objects, nameless objects, live objects, arrays of objects  | 23% | 15 |
| <b>Unit 4: Functions, Function Overloading and Inheritance</b><br>– Introduction to functions, library and user-defined functions, parameters passing, default arguments<br>– Functions overloading, inline functions, friend functions<br>– Inheritance: Introduction, derived class declaration, types of inheritance and member access ability, constructor and destructor in derived class, construction invocation and data member initialization.<br>– virtual functions | 22% | 15 |
| <b>Unit 5: Operator Overloading, Pointers and Files</b><br>– Operator overloading : Introduction, overloaded operators, unary operator overloading, operator keyword, operator return values, binary operators overloading, overloading with friend function<br>– Usages of Pointers in C++ : basic overview Dynamic memory allocation<br>– Files : introduction and applications<br>– File operations : open, read, write, seek and close                                     | 22% | 12 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. <b>Create</b> a class representing a student with attributes like name, roll number, and marks. Implement member functions to set and get the values of these attributes.                     | 10%       | 3             |
| 2. Implement a class representing a bank account with attributes like account number, account holder name, and balance. Include member functions to deposit and withdraw money from the account. | 10%       | 3             |
| 3. <b>Create</b> a class called "Rectangle" with attributes length and width. Implement member functions to calculate the area and perimeter of the rectangle.                                   | 10%       | 3             |



|   |     |   |
|---|-----|---|
| 4. <b>Design a class</b> called "Date" that represents a calendar date. Include member functions to set the date, display the date in different formats (e.g., DD/MM/YYYY, Month DD, YYYY), and calculate the number of days between two dates. | 10% | 3 |
| 5. <b>Create a class</b> called "Car" with attributes like make, model, and year. Implement member functions to start the car, accelerate, and brake.   | 10% | 3 |
| 6. <b>Develop a class</b> called "Employee" with attributes like name, employee ID, and salary. Include member functions to calculate the annual salary and give a raise to an employee.  | 10% | 3 |
| 7. Implement a class called "Stack" using an array to simulate a stack data structure. Include member functions to push elements onto the stack, pop elements from the stack, and check if the stack is empty.                                  | 10% | 3 |
| 8. <b>Create a class</b> called "Fraction" to represent a fraction (numerator and denominator). Implement member functions to add, subtract, multiply, and divide fractions.  | 10% | 3 |
| 9. <b>Design a class</b> called "Person" with attributes like name, age, and address. Include member functions to display the person's details and update their address.  | 10% | 3 |
| 10. Implement a class called "Bank" that manages a collection of bank accounts. Include member functions to add a new account, remove an account, and find the account with the highest balance.  | 10% | 3 |

**Instructional Method and Pedagogy:** Chalk board, demonstrations, Hands on sessions, discussion, Quizzes, online materials

| <b>Course Outcomes:</b>   | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|---|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:                      |                                |                                    |
| CO1: <b>understand</b> Object Oriented Programming concepts using C++.                          | Remember, Understand           | Define, List, Explain, Use.        |
| CO2: <b>understand</b> concepts of Input/output, arrays and working with strings                | Remember, Understand           | Define, List, Explain, Use.        |
| CO3: <b>understand</b> the concepts of class structure and designing and implementing the class | Remember, Understand           | Define, List, Explain, Use.        |

|   |                                      |                         |            |
|---|--------------------------------------|-------------------------|------------|
| CO4: <b>use</b> functions, function overloading and inheritance to <b>develop</b> the programs. | Remember, Understand, create, apply, | Define, Explain, Design | List, Use, |
| CO5: <b>use</b> operator overloading, pointers and files to <b>develop</b> the programs.        | Remember, Understand, create, apply, | Define, Explain, Design | List, Use, |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <p><b>Reference Books:</b></p> <p>1. Robert Lafore : Object Oriented Programming in Turbo C++, Guide, Galgotia Pub.</p> <p>2. John R. Hubbard : Programming with C++ (Schaum's Outlines), McGraw Hill, Second Edition, 2000.</p> <p><b>Text Books:</b></p> <p>1. E Balagurusamy : Object Oriented Programming in C++, Tata McGraw-Hill Publishing Co. Ltd.</p> <p>2. BarkakatiN. : Object Oriented Programming in C++, PHI.</p> <p>3. OOP's using C++ for Dummies.</p> |
| 2.                 | Journals & Periodicals:  |
| 3.                 | Other Electronic Resources:  |

| Evaluation Scheme   | Total Marks   |            |          |      |          |   |          |   |          |              |                 |
|---|---|------------|----------|------|----------|---|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>   | 20 marks  |            |          |      |          |   |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>   | 40 marks  |            |          |      |          |   |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b>                          | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment / Skill enhancement activities / case study / Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review /Presentation/ miscellaneous activities / Projects</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment / Skill enhancement activities / case study / Assignment | 15 marks | Article Review /Presentation/ miscellaneous activities / Projects | 10 marks | <b>Total</b> | <b>40 Marks</b> |
| Attendance  | 05 marks  |            |          |      |          |   |          |   |          |              |                 |
| MCQs  | 10 marks  |            |          |      |          |   |          |   |          |              |                 |
| Open Book Assignment / Skill enhancement activities / case study / Assignment | 15 marks  |            |          |      |          |   |          |   |          |              |                 |
| Article Review /Presentation/ miscellaneous activities / Projects             | 10 marks  |            |          |      |          |   |          |   |          |              |                 |
| <b>Total</b>  | <b>40 Marks</b>   |            |          |      |          |   |          |   |          |              |                 |



| Practical Marks | Attendance     | 05 marks        |
|-----------------|----------------|-----------------|
|                 | Practical Exam | 20 marks        |
|                 | Viva           | 10 marks        |
|                 | Journal        | 10 marks        |
|                 | Discipline     | 05 marks        |
|                 | <b>Total</b>   | <b>50 Marks</b> |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 2    | 1    | 3    | 0    | 2    | 1    |
| CO2 | 2    | 1    | 0    | 3    | 2    | 0    |
| CO3 | 3    | 2    | 0    | 1    | 2    | 1    |
| CO4 | 1    | 0    | 2    | 3    | 0    | 1    |
| CO5 | 0    | 1    | 1    | 1    | 2    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 1   |
| CO3 | 1   | 1   | 0   | 1   | 1   | 0   |
| CO4 | 1   | 3   | 2   | 1   | 0   | 1   |
| CO5 | 0   | 0   | 1   | 1   | 0   | 0   |

|                               |                                      |                       |
|-------------------------------|--------------------------------------|-----------------------|
| <b>COURSE CODE</b><br>BCCA204 | <b>COURSE NAME</b><br>WEB TECHNOLOGY | <b>SEMESTER</b><br>II |
|-------------------------------|--------------------------------------|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 15                      | 15        | 0        | 30          | 1               | 1         | 0        | 2            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | Basic Programming  |
| <b>Course Category</b>                             | Mandatory courses  |
| <b>Course focus</b>                                | Skill development  |
| <b>Rationale</b>                                   | <p>Web technology plays a significant role in both local and global contexts. At a local level, web technology enables businesses and individuals to create an online presence, reach local customers, and provide essential services. It facilitates local communication, e-commerce, and community engagement. Nationally, web technology drives digital transformation, supporting economic growth, government services, and education. It enables efficient information sharing, e-governance, and online learning platforms. Internationally, web technology connects people globally, transcending geographical boundaries. The relevance of web technology lies in its ability to empower individuals, connect societies, and foster inclusive and interconnected digital ecosystems at various levels.</p> |
| <b>Course Revision/ Approval Date:</b>             | 24/1/2022  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | <p>To enable the student to:</p> <ol style="list-style-type: none"> <li>1. Provide brief idea about html for web page development</li> <li>2. Be aware about CSS - to design web page</li> <li>3. Elaborate working of JavaScript</li> <li>4. Understand regarding how JQuery can enhance look and feel of webpage</li> <li>5. Familiarize students with components and working of bootstrap..</li> </ol>  |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>Unit 1: HTML &amp; CSS</b><br>Introduction, Elements, Tags, Formatting, Links, Font, Images, Tables, Web Forms, Form Elements, Formatting | 20%       | 9             |

|  |     |   |
|--|-----|---|
| Form Attributes, Form Input Types, Media Elements, Canvas, SVG, CSS3 Introduction, Borders, Backgrounds, Text Effects, Text, Transitions, Animations, Multiple Columns, Transforms   |     |   |
| <b>Unit 2: JAVASCRIPT</b><br>Introduction, Operators, Function & Object, Methods, Conditional Statement & Looping Statement, Event Types   | 20% | 9 |
| <b>Unit 3: JQuery</b><br>Introduction, Retrieving Page Content, Manipulating Page Content, Working with Events, JQuery Animations and Effects, Using the jQuery UI Plugins   | 20% | 9 |
| <b>Unit 4: Bootstrap and XML</b><br>Introduction, Bootstrap Grid, Bootstrap Components<br>Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT   | 20% | 9 |
| <b>Unit 5: Introduction to PHP</b><br>Introduction to PHP, Operators and Variables, Control Structures, Looping and Error handling, Iterables, PHP functions, String Functions, Array Functions, Mathematical Functions, Graphics Library (GD Support), Superglobals, Date and Time Functions, Misc. Function, Include, File handling, Object Oriented Features of PHP, Classes and Objects, Constructors, Destructor, Serialization, Inheritance, Abstract Class, Interface, Trait, namespace | 20% | 9 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Write a program in create a HTML page, which has properly aligned paragraphs with image, display list of items in different styles.<br>2. Display various text formatting tags available in HTML.(i.e.<h1>,<b>,<u> etc...), special characters. 3. Create a HTML file which displays 3 images at LEFT, RIGHT and CENTER respectively in the browser. 4. Demonstrate following attributes using CSS Color and background Font, Text, Border, Margin, hyperlinks and list<br>5. Demonstrate use of external style sheet |           |               |
| 1. To create an html page to explain the use of various predefined functions in an array & Date object in JavaScript.<br>2. Write a Program to show use of alert, confirm and prompt box.<br>3. Write JavaScript to perform the following operations: 4.   |           |               |



|  |  |  |
|--|--|--|
| to find highest from given three values<br>5. to calculate factorial of n<br>6. to calculate sum of 1 to n<br>7. to check whether given number is palindrome or not 8.<br>Write a Java Script program to print current date & time |  |  |
| 1. Develop the jQuery Program with the scripting tag. 2.<br>Develop the jQuery Program with the event methods.   |  |  |
| Create CD Catalogue Table in XML and display it using<br>XSL Style Sheet   |  |  |
| 1. Write a PHP script for Looping Structures<br>2. Write a PHP script for Switch Case statements<br>3. Write a PHP script for Class , objects and inheritance<br>4. Write a PHP script for Constructor and destructor              |  |  |

Instructional Method and Pedagogy: Hands-on sessions, Discussions, Power Point, Chalk and Board

| Course Outcomes:   | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain |
|--|-------------------------|-----------------------------|
| After successful completion of the above course, students will be able to: |                         |                             |
| CO1: Understand the importance and need of client side scripting           | Cognitive               | Understand                  |
| CO2: Analyze and Develop static and dynamic web applications.              |                         | Understand, Apply           |
| CO3: Develop responsive websites   |                         | Create                      |
| CO4: Apply the jquery to enhance the creative web page.                    |                         | Understand, Apply           |
| CO5: Apply Bootstrap in real time web application development.             |                         | Apply                       |

### Learning Resources

|    |  |
|----|--|
| 1. | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Eric Freeman, HTML 5 Black Book, Dreamtech Press , Head First HTML5 Programming</li> <li>Jake Spurlock, Bootstrap, O'Reilly Media</li> </ol> <p><b>Text Books:</b></p>   |
| 2. | Journals & Periodicals:  |
| 3. | <p><b>Other Electronic Resources:</b></p> <ol style="list-style-type: none"> <li>HTML, CSS, JAVASCRIPT<br/><a href="https://www.youtube.com/playlist?list=PL41lfR6DnOruqMacTfff1zrEcqtm7Fv">https://www.youtube.com/playlist?list=PL41lfR6DnOruqMacTfff1zrEcqtm7Fv</a></li> <li>JQuery<br/><a href="https://www.youtube.com/playlist?list=PLZdjW012sjggLnRyanevMkgu51xehoQr">https://www.youtube.com/playlist?list=PLZdjW012sjggLnRyanevMkgu51xehoQr</a></li> <li>Bootstrap<br/><a href="https://www.youtube.com/watch?v=aTLRdrRQyN4">https://www.youtube.com/watch?v=aTLRdrRQyN4</a></li> </ol> |



|  |  |
|--|--|
|  |  |
|--|--|

| Evaluation Scheme                                    | Total Marks   |                 |          |                |          |   |          |   |          |              |                 |              |                 |
|--|---|-----------------|----------|----------------|----------|---|----------|---|----------|--------------|-----------------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks  |                 |          |                |          |   |          |   |          |              |                 |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks  |                 |          |                |          |   |          |   |          |              |                 |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1" style="width: 100%;"> <tr> <td>Attendance</td> <td style="text-align: right;">05 marks</td> </tr> <tr> <td>MCQs</td> <td style="text-align: right;">10 marks</td> </tr> <tr> <td>Open Book Assignment / Skill enhancement activities / case study / Assignment</td> <td style="text-align: right;">15 marks</td> </tr> <tr> <td>Article Review /Presentation/ miscellaneous activities / Projects</td> <td style="text-align: right;">10 marks</td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>40 Marks</b></td> </tr> </table> | Attendance      | 05 marks | MCQs           | 10 marks | Open Book Assignment / Skill enhancement activities / case study / Assignment | 15 marks | Article Review /Presentation/ miscellaneous activities / Projects | 10 marks | <b>Total</b> | <b>40 Marks</b> |              |                 |
|  | Attendance  | 05 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | MCQs  | 10 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Open Book Assignment / Skill enhancement activities / case study / Assignment   | 15 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Article Review /Presentation/ miscellaneous activities / Projects   | 10 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | <b>Total</b>  | <b>40 Marks</b> |          |                |          |   |          |   |          |              |                 |              |                 |
| <b>Practical Marks</b>                               | <table border="1" style="width: 100%;"> <tr> <td>Attendance</td> <td style="text-align: right;">05 marks</td> </tr> <tr> <td>Practical Exam</td> <td style="text-align: right;">20 marks</td> </tr> <tr> <td>Viva</td> <td style="text-align: right;">10 marks</td> </tr> <tr> <td>Journal</td> <td style="text-align: right;">10 marks</td> </tr> <tr> <td>Discipline</td> <td style="text-align: right;">05 marks</td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>50 Marks</b></td> </tr> </table>  | Attendance      | 05 marks | Practical Exam | 20 marks | Viva  | 10 marks | Journal   | 10 marks | Discipline   | 05 marks        | <b>Total</b> | <b>50 Marks</b> |
|  | Attendance  | 05 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Practical Exam  | 20 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Viva  | 10 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Journal   | 10 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
|  | Discipline  | 05 marks        |          |                |          |   |          |   |          |              |                 |              |                 |
| <b>Total</b>   | <b>50 Marks</b>   |                 |          |                |          |   |          |   |          |              |                 |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 2    | 2    | 3    | 1    | 0    | 0    |
| CO2 | 3    | 2    | 2    | 2    | 1    | 1    |
| CO3 | 2    | 2    | 2    | 1    | 1    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 1    |
| CO5 | 2    | 0    | 0    | 1    | 0    | 1    |



### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 2   | 1   | 1   |
| CO3 | 1   | 1   | 2   | 1   | 1   | 1   |
| CO4 | 0   | 2   | 1   | 0   | 1   | 1   |
| CO5 | 0   | 0   | 1   | 1   | 0   | 0   |

---

|                               |  |                       |
|-------------------------------|--|-----------------------|
| <b>COURSE CODE</b><br>BCCA205 | <b>COURSE NAME</b><br>Data Structure and Algorithm | <b>SEMESTER</b><br>II |
|-------------------------------|--|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 15        | 0        | 60          | 3               | 1         | 0        | 4            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | None  |
| <b>Course Category</b>                             | Major   |
| <b>Course focus</b>                                | Employability   |
| <b>Rationale</b>                                   | This course provides the basic idea about the structures, operations on them, and also gives insights as to how to sort them using different techniques.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> Fundamentals of data structures.<br>2: <b>Understand the</b> Basic concepts related to stacks, queues.<br>3: <b>Apply</b> basic concepts related to trees and linked lists<br>4: <b>Understand and Apply</b> the fundamentals of sorting and searching techniques<br>5: <b>understand</b> the concepts related to file organization |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>UNIT-I:</b> Introduction to RDBMS, E-R Diagram: Entities, Attributes and Types of Relationships; Introduction to DBMS – Terminology, Advantages, Keys; Normalization (1NF, 2NF, 3NF); Introduction to SQL- Types of SQL Statements: DDL (Data Definition Language), DML (Data Manipulation Language), DQL (Data Query Language), DCL (Data Control Language), TCL (Transaction Control Language). | 23%       | 5             |
| <b>UNIT-II:</b> Basic SQL Concepts Built-in Data Types – (Number, Char, Varchar2, Date); Creating Table and Inserting Data, Retrieving Data Using Query, Manipulating Data using DELETE and UPDATE; Modifying table structure, Removing table, Pseudo Columns – ROWID, ROWNUM, USER, SYSDATE,  | 23%       | 10            |



|  |     |    |
|--|-----|----|
| Null values, TAB table, DUAL table, Operators – Arithmetic, Relational, Logical, Range Searching, Pattern Matching and Set operators   |     |    |
| <b>UNT-III:</b> Data Constraints and Built-in Functions Data constraints – Introduction, Type of data constraints (Not Null, Unique, Primary Key, Foreign Key and Check); ALTER TABLE to add/remove constraints; Scalar Functions: Numeric (Abs, Floor, Mod, Power, Round, Sign, Sqrt, Trunc), Character (Chr, Ascii, Concat, Initcap, Lower, Substr, Trim, Upper), Date (Add_Months, Last_Day, Next_Day, Months_Between), Conversion (To_Number, To_Char And To_Date); Aggregate Functions: (Avg, Count, Max, Min, Sum), Miscellaneous: (Nvl, Decode) | 24% | 10 |
| <b>UNIT-IV:</b> Advanced Concepts Query and Subquery, IN, ANY and ALL operators, Joining Tables, Types of Joins (Cross Join, Natural Join, Inner Join, Equijoin, Outer Joins, and Self Join),  | 17% | 10 |
| <b>UNIT-V:</b> Views – Advantages and Disadvantages of View, Creating, Dropping, Use and Characteristics of Updateable and Non-Updateable Views, Transaction Processing Commands (Commit, Rollback and Savepoint), Introduction to PL/SQL  | 13% | 10 |

| List Of Practical   | Weightage | Contact hours |
|---|-----------|---------------|
| 1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) | 5%        | 3             |
| 2. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys)                      | 10%       | 3             |
| 3. Normalization -To remove the redundancies and anomalies in the relational tables, Normalize up to Third Normal Form  | 10%       | 2             |
| 4. Design a Database and create required tables. For e.g. Bank, College Database  | 5%        | 2             |
| 5. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.   | 15%       | 4             |
| 6. Write a sql statement for implementing ALTER,UPDATE and DELETE   | 5%        | 2             |
| 7. Implementing Scalar Functions: Numeric , Character, Date , Conversion  | 10%       | 5             |
| 8. Write the query for implementing the Aggregate functions: MAX(),MIN(),AVG(),COUNT()  | 10%       | 5             |



|   |     |   |
|---|-----|---|
| 9. Write the queries to implement the joins.                | 10% | 2 |
| 10. To apply the concept of Transaction Processing Commands | 20% | 2 |

Instructional Method and Pedagogy: Chalk-board, discussions, quizzes, online materials, Hands-on sessions, Blended learning approach incorporating usage of ICT tools

| Course Outcomes:   | Blooms' Taxonomy Domain                      | Blooms' Taxonomy Sub Domain        |
|--|--|------------------------------------|
| After successful completion of the above course, students will be able to:                                 |  |                                    |
| CO1. <b>Apply</b> the basic concepts of Database Systems and Applications                                  | Remember, Understand, analyse, apply, create | Define, List, Explain, Use, Design |
| CO2. <b>Apply</b> the concepts of SQL and construct queries using SQL in database creation and interaction | Remember, Understand, analyse, apply, create | Define, List, Explain, Use, Design |
| CO3. <b>Analyze</b> and Select storage and recovery techniques of database system                          | Remember, Understand, analyse, apply, create | Define, List, Explain, Use, Design |
| CO4. <b>Apply</b> constraints and relational algebra operations.   | Remember, Understand, analyse                | Define, List, Explain, Use.        |
| CO5. <b>Understanding</b> of the concepts of concurrency control and transaction management                | Remember, Understand                         | Define, List, Explain, Use.        |

| Learning Resources |  |
|--------------------|--|
| 1.                 | Reference Books:<br>Database Management Systems by Arun K Majmudar, Pritimoy Bhattacharyya.<br>An introduction to database management systems by Bipin C Desai.<br>Developing client server applications using Oracle Developer 2000 by Ivan Bayross, 1997.<br>Textbooks:<br>Understanding Database Management Systems : S. Parthasarthy and B.W.Khalkar, First edition – 2007, Master Academy<br>P. S. Deshpande : SQL/PLSQL for Oracle9i, dreamtech press, reprint edition 2009. |
| 2.                 | Journals & Periodicals:<br><a href="https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm">https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm</a><br><a href="https://www.javatpoint.com/what-is-rdbms">https://www.javatpoint.com/what-is-rdbms</a><br><a href="https://www.w3schools.com/">https://www.w3schools.com/</a>   |
| 3.                 | Other Electronic Resources:<br><a href="https://onlinecourses.nptel.ac.in/noc19_cs46/preview">https://onlinecourses.nptel.ac.in/noc19_cs46/preview</a>   |

| <b>Evaluation Scheme</b>                             | <b>Total Marks</b>  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
|--|---|------------|----------|----------------|----------|----------------------|----------|----------------|----------|--------------|-----------------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table>                                     | Attendance | 05 marks | MCQs           | 10 marks | Open Book Assignment | 15 marks | Article Review | 10 marks | <b>Total</b> | <b>40 Marks</b> |              |                 |
| Attendance   | 05 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| MCQs   | 10 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Open Book Assignment                                 | 15 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Article Review                                       | 10 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Total</b>   | <b>40 Marks</b>   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Practical Marks</b>                               | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>50 Marks</b></td> </tr> </table> | Attendance | 05 marks | Practical Exam | 20 marks | Viva                 | 10 marks | Journal        | 10 marks | Discipline   | 05 marks        | <b>Total</b> | <b>50 Marks</b> |
| Attendance   | 05 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Practical Exam                                       | 20 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Viva   | 10 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Journal  | 10 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Discipline   | 05 marks  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Total</b>   | <b>50 Marks</b>   |            |          |                |          |                      |          |                |          |              |                 |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 1    | 0    | 2    | 1    |
| CO2 | 2    | 3    | 1    | 0    | 2    | 1    |
| CO3 | 2    | 1    | 3    | 2    | 2    | 0    |
| CO4 | 3    | 2    | 1    | 2    | 0    | 1    |
| CO5 | 1    | 2    | 0    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3   | 2   | 2   | 0   | 2   | 1   |
| CO2 | 2   | 1   | 1   | 0   | 2   | 1   |
| CO3 | 2   | 1   | 3   | 2   | 1   | 0   |
| CO4 | 3   | 2   | 1   | 2   | 0   | 1   |
| CO5 | 1   | 0   | 0   | 0   | 0   | 1   |

---

|                               |   |                       |
|-------------------------------|---|-----------------------|
| <b>COURSE CODE</b><br>AECC201 | <b>COURSE NAME</b><br>Communication Skills in English | <b>SEMESTER</b><br>II |
|-------------------------------|---|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | Student should have cleared First Semester of Bachelor of Science   |
| <b>Course Category</b>                             | Ability Enhancement   |
| <b>Course focus</b>                                | Skills Development  |
| <b>Rationale</b>                                   | It enables learners to apply Communicational knowledge, practices in day to day Corporate and Organizational settings.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | <p>To enable the student to:</p> <ol style="list-style-type: none"> <li><b>Develop</b> their basic communication skills in English.</li> <li><b>Use</b> English language with basic rules and regulations as per grammar rules.</li> <li>Equip learners of language to <b>develop</b> art of listening and reading in English language.</li> <li>Equip them with writing skills needed for academic as well as workplace context.</li> <li>Strengthen digital communication using technological modules and expertise.</li> </ol> |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Communicative Skills</b><br>Basics of Communication, Verbal & Non-verbal Communication, Barriers to Effective Communication, Strategies of Effective Communication   | 20%       | 6             |
| <b>Unit 2: Grammar &amp; Vocabulary:</b><br>Types of sentences, Synonyms, Antonyms, Tenses - Past, Present & Future, Homophones, Modals, Verb forms, Phrasal Verbs, Error correction, commonly misused words, technical terms | 15%       | 5             |
| <b>Unit 3: Listening &amp; Reading Skills:</b><br>Definitions (Listening & Reading), Types of Listening, Barriers to Effective Listening, Traits of a Good Listener,  | 30%       | 9             |

|   |            |   |
|---|------------|---|
| Types of Reading, Techniques of Effective Reading, Reading Tasks (Critical & Inferential)   |            |   |
| <b>Unit 4: Writing Skills &amp; Speaking Skills:</b><br>Letter writing - Complaint & Leave, Article, Precise writing, Report writing, Note-taking and Note-making, Creative Writing Introducing self, Interview Skills, Public Speaking, Debates, Role plays, Group Discussion. | <b>25%</b> | 7 |
| <b>Unit 5:ICT/ Digital/ E-Skills:</b> Computer Assisted Language Learning (CALL), Mobile Assisted Language Learning (MALL), Emails, Blogs, Digital/ E-Portfolio, Filling Online Application Forms   | <b>20%</b> | 6 |

**Instructional Method and Pedagogy:** Classroom Lecture, Case Studies, Quizzes, Presentations, Role Play, Expert Lecture (Consultant)

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b>       |
|--|--------------------------------|--|
| After successful completion of the above course, students will be able to:                                 |                                |  |
| CO1: emphasize the development of listening and reading skills among learners                              | Understand, Analyse, Remember  | Define, Classify & Demonstrate           |
| CO2: equip them with writing skills needed for academic as well as workplace context                       | Analyse, Apply, Understand     | Classify, Describe & Demonstrate         |
| CO3: enable learners to develop their basic communication skills in English                                | Understand, remember           | Define, Describe & Demonstrate           |
| CO4: strengthen the communicational attitude in English Language.  | Remember, Analyse              | Define Describe                          |
| CO5: build up the confidence to communicate with the world using latest technological advanced equipments. | Understand, Apply              | Define, Classify, Describe & Demonstrate |

**Learning Resources**

|    |   |
|----|---|
| 1. | <p><b>Reference Books :</b></p> <ol style="list-style-type: none"> <li>1. Murphy, Raymond.(1998), Intermediate English Grammar, New York</li> <li>2. Wren &amp; Martin (2001), English Grammar &amp; Composition, New York</li> <li>3. Mudambadithaya G.S., (2002) English Grammar and composition</li> <li>4. Digne, Flinders and Sweeney (2010) Cambridge University press</li> <li>5. Lupton, Mary Jane (1998). <i>Maya Angelou: A Critical Companion</i>. Westport, : Greenwood Press. ISBN 978-0-313-303225.</li> <li>6. Booher, Diana. (2004), <i>Booher's Rules of Business Grammar</i>, OUPUr, Penny (2002), <i>Grammar Practice Activities</i>, OUP</li> </ol> |
|----|---|

|    |  |
|----|--|
|    | <b>Text book:</b><br>1. An Introduction to Professional English and Soft Skills by B K Das |
| 2. | Journals & Periodicals:  |
| 3. | Other Electronic Resources:  |

| Evaluation Scheme                                    | Total Marks  |            |   |      |    |                      |    |  |    |              |           |
|--|--|------------|---|------|----|----------------------|----|--|----|--------------|-----------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |   |      |    |                      |    |  |    |              |           |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |   |      |    |                      |    |  |    |              |           |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>5</td> </tr> <tr> <td>MCQs</td> <td>10</td> </tr> <tr> <td>Open Book Assignment</td> <td>15</td> </tr> <tr> <td>Presentation/ miscellaneous activities</td> <td>10</td> </tr> <tr> <td><b>Total</b></td> <td><b>40</b></td> </tr> </table> | Attendance | 5 | MCQs | 10 | Open Book Assignment | 15 | Presentation/ miscellaneous activities | 10 | <b>Total</b> | <b>40</b> |
| Attendance   | 5  |            |   |      |    |                      |    |  |    |              |           |
| MCQs   | 10   |            |   |      |    |                      |    |  |    |              |           |
| Open Book Assignment                                 | 15   |            |   |      |    |                      |    |  |    |              |           |
| Presentation/ miscellaneous activities               | 10   |            |   |      |    |                      |    |  |    |              |           |
| <b>Total</b>   | <b>40</b>  |            |   |      |    |                      |    |  |    |              |           |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 1    | 1    | 0    | 0    |
| CO2 | 1    | 1    | 2    | 2    | 1    | 1    |
| CO3 | 0    | 2    | 1    | 1    | 1    | 0    |
| CO4 | 1    | 1    | 0    | 0    | 0    | 1    |
| CO5 | 2    | 1    | 0    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 1   | 1   | 0   | 0   | 1   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 1   |
| CO4 | 1   | 2   | 2   | 0   | 0   | 1   |
| CO5 | 0   | 0   | 1   | 1   | 0   | 0   |

# Semester - III

---

**Teaching Scheme**  
**Semester – III**

| Sr. No. | Course Code | Course Name                                 | Teaching Scheme (Hours) |           |           |            | Teaching Credit |          |          |           | Evaluation Scheme |                   |                  |              |                 |             |
|---------|-------------|---|-------------------------|-----------|-----------|------------|-----------------|----------|----------|-----------|-------------------|-------------------|------------------|--------------|-----------------|-------------|
|         |             |   | L                       | P         | T         | Total      | L               | P        | T        | Total     | Theory: MS Marks  | Theory: CEC Marks | Theory: ES Marks | Theory Marks | Practical Marks | Total Marks |
| 1       | BCCA301     | Database Management System                  | 30                      | 30        | 0         | 60         | 2               | 1        | 0        | 3         | 20                | 40                | 40               | 100          | 50              | 150         |
| 2       | BCCA302     | Data Structure and Algorithm                | 30                      | 30        | 0         | 60         | 2               | 1        | 0        | 3         | 20                | 40                | 40               | 100          | 50              | 150         |
| 3       | BCCA303     | Server Side Scripting                       | 45                      | 30        | 0         | 75         | 3               | 1        | 0        | 4         | 20                | 40                | 40               | 100          | 50              | 150         |
| 4       | BCCA304     | Computer Network                            | 30                      | 0         | 0         | 30         | 2               | 0        | 0        | 2         | 20                | 40                | 40               | 100          | 0               | 100         |
| 5       | BCCA305     | Numerical Methods and Analysis using MATLAB | 30                      | 30        | 0         | 60         | 2               | 1        | 0        | 3         | 20                | 40                | 40               | 100          | 50              | 100         |
| 6       | CBBCS3XX    | CBBCS Courses                               | 30                      | 0         | 0         | 30         | 2               | 0        | 0        | 2         | 20                | 40                | 40               | 100          | 0               | 100         |
| 7       | AECC301     | Indian Constitution                         | 30                      | 0         | 0         | 30         | 2               | 0        | 0        | 2         | 20                | 40                | 40               | 100          | 0               | 100         |
| 8       |             |   |                         |           |           |            |                 |          |          |           |                   |                   |                  |              |                 |             |
|         |             | <b>Total</b>                                | <b>235</b>              | <b>90</b> | <b>30</b> | <b>315</b> | <b>15</b>       | <b>3</b> | <b>1</b> | <b>19</b> | <b>210</b>        | <b>280</b>        | <b>280</b>       | <b>700</b>   | <b>150</b>      | <b>850</b>  |

**Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester**



### Summary of Credits:

| Sr. No. | Semester | Course Code | Course Name                  | Theory marks | Practical marks | Course Credit |
|---------|----------|-------------|------------------------------|--------------|-----------------|---------------|
| 1       | III      | BCCA301     | Database Management System   | 100          | 50              | 3             |
| 2       | III      | BCCA302     | Data Structure and Algorithm | 100          | 50              | 3             |
| 3       | III      | BCCA303     | Server Side Scripting        | 100          | 50              | 4             |
| 4       | III      | BCCA304     | Computer Network             | 100          | 0               | 2             |
| 5       | III      | BCCA305     | Graph Theory                 | 100          | 0               | 3             |
| 6       | III      | CBCS3XX     | CBCS Courses                 | 100          | 0               | 2             |
| 7       | III      | AECC301     | Indian Constitution          | 100          | 0               | 2             |
|         |          |             | <b>Total</b>                 | <b>700</b>   | <b>150</b>      | <b>19</b>     |

**Second Year**

|                                      |   |                               |
|--------------------------------------|---|-------------------------------|
| <b>COURSE CODE</b><br><b>BCCA301</b> | <b>COURSE NAME</b><br><b>Database Management System</b> | <b>SEMESTER</b><br><b>III</b> |
|--------------------------------------|---|-------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 30        | 0        | 60          | 2               | 1         | 0        | 3            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                       | None   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Employability  |
| <b>Rationale</b>                                   | This subjects provides basic concepts of Database Systems and Applications, SQL and construct queries using SQL in database creation and interaction   |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> basic database concepts, applications, data models, schemas and instances.<br>2: <b>demonstrate</b> the use of constraints and relational algebra operations.<br>3: <b>Describe</b> the basic of SQL and construct queries using SQL<br>4: <b>Understand</b> the importance of normalization in databases<br>5. <b>Apply and demonstrate</b> the use of concurrency control and transaction management |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>UNIT-I:</b> Introduction to RDBMS and SQL Data models – Hierarchical, Network, Relational: Concepts and Terminology, E-R Diagram: Entities, Attributes and Types of Relationships; Introduction to DBMS – Terminology, Advantages, Keys; Normalization (1NF, 2NF, 3NF); Introduction to SQL- Types of SQL Statements: DDL (Data Definition Language), DML (Data Manipulation Language), DQL (Data Query Language), DCL (Data Control Language), TCL (Transaction Control Language). | 23%       | 7             |
| <b>UNIT-II:</b> Basic SQL Concepts Built-in Data Types – (Number, Char, Varchar2, Date); Creating Table and Inserting Data, Retrieving Data Using Query, Manipulating Data using DELETE and UPDATE; Modifying table structure, Removing table, Pseudo Columns – ROWID, ROWNUM, USER, SYSDATE, Null values, TAB table,  | 23%       | 7             |

|   |     |   |
|---|-----|---|
| DUAL table, Operators – Arithmetic, Relational, Logical, Range Searching, Pattern Matching and Set operators  |     |   |
| <b>UNIT-III:</b> Data Constraints and Built-in Functions Data constraints – Introduction, Type of data constraints (Not Null, Unique, Primary Key, Foreign Key and Check); ALTER TABLE to add/remove constraints; Scalar Functions: Numeric (Abs, Floor, Mod, Power, Round, Sign, Sqrt, Trunc), Character (Chr, Ascii, Concat, Initcap, Lower, Substr, Trim, Upper), Date (Add_Months, Last_Day, Next_Day, Months_Between), Conversion (To_Number, To_Char And To_Date); Aggregate Functions: (Avg, Count, Max, Min, Sum), Miscellaneous: (Nvl, Decode) | 24% | 7 |
| <b>UNIT-IV:</b> Advanced Concepts Query and Subquery, IN, ANY and ALL operators, Joining Tables, Types of Joins (Cross Join, Natural Join, Inner Join, Equijoin, Outer Joins, and Self Join),   | 17% | 5 |
| <b>UNIT-V:</b> Views – Advantages and Disadvantages of View, Creating, Dropping, Use and Characteristics of Updateable and Non-Updateable Views, Transaction Processing Commands (Commit, Rollback and Savepoint), Introduction to PL/SQL   | 13% | 4 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Practicals based on Basic formatting in HTML.                   | 10%       | 3             |
| 2. Practicals based on HTML Lists.                                 | 10%       | 3             |
| 3. Practicals based on HTML Images.                                | 5%        | 1             |
| 4. Practicals based on HTML Hyperlinks.                            | 5%        | 1             |
| 5. Practicals based on HTML Tables.                                | 15%       | 4             |
| 6. Practicals based on Frames and Framesets.                       | 5%        | 2             |
| 7. Practicals based on HTML Forms.                                 | 10%       | 5             |
| 8. Practicals based on basic CSS styling using various properties. | 10%       | 5             |
| 9. Practicals based on transforming XML using XSLT                 | 5%        | 2             |
| 10. Practicals based on Bootstrap.                                 | 5%        | 2             |
| 11. Practicing making complete single-page sites with styling      | 20%       | 2             |

**Instructional Method and Pedagogy:** Chalk-board, Demonstrations, Practical sessions, discussions, quizzes, online materials, Classroom Interaction and in addition demonstration through case studies and ICT based applications

| Course Outcome:  | Blooms' Taxonomy Domain                      | Blooms' Taxonomy Sub Domain         |
|--|--|-------------------------------------|
| After successful completion of the above course, students will be able to:                                 |  |                                     |
| CO1. <b>Apply</b> the basic concepts of Database Systems and Applications                                  | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |
| CO2. <b>Apply</b> the concepts of SQL and construct queries using SQL in database creation and interaction | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |
| CO3. <b>Analyze</b> and Select storage and recovery techniques of database system                          | Remember, Understand, analyse, apply, create | Define, Explain, Design, List, Use, |
| CO4. <b>Apply</b> constraints and relational algebra operations.   | Remember, Understand, analyse                | Define, Explain, Use, List,         |
| CO5. <b>Understanding</b> of the concepts of concurrency control and transaction management                | Remember, Understand                         | Define, Explain, Use, List,         |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Database Management Systems by Arun K Majmudar, Pritimoy Bhattacharyya.</li> <li>An introduction to database management systems by Bipin C Desai.</li> <li>Developing client server applications using Oracle Developer 2000 by Ivan Bayross, 1997.</li> </ol> <p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>Understanding Database Management Systems : S. Parthsarthy and B.W.Khalkar, First edition – 2007, Master Academy</li> <li>P. S. Deshpande : SQL/PLSQL for Oracle9i, dreamtech press, reprint edition 2009.</li> </ol> |
| 2.                 | <p>Journals &amp; Periodicals:</p> <p><a href="https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm">https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm</a></p> <p><a href="https://www.javatpoint.com/what-is-rdbms">https://www.javatpoint.com/what-is-rdbms</a></p>   |
| 3.                 | Other Electronic Resources:  |

| Evaluation Scheme                                    | Total Marks  |                 |          |                |          |  |          |   |          |              |                 |              |                 |
|--|--|-----------------|----------|----------------|----------|--|----------|---|----------|--------------|-----------------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |                 |          |                |          |  |          |   |          |              |                 |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |                 |          |                |          |  |          |   |          |              |                 |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment/Presentation / miscellaneous activities / Project</td> <td>15 marks</td> </tr> <tr> <td>Skill enhancement activities / case study / Lab Submissions</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance      | 05 marks | MCQs           | 10 marks | Open Book Assignment/Presentation / miscellaneous activities / Project | 15 marks | Skill enhancement activities / case study / Lab Submissions | 10 marks | <b>Total</b> | <b>40 Marks</b> |              |                 |
|  | Attendance   | 05 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | MCQs   | 10 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Open Book Assignment/Presentation / miscellaneous activities / Project   | 15 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Skill enhancement activities / case study / Lab Submissions  | 10 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | <b>Total</b>   | <b>40 Marks</b> |          |                |          |  |          |   |          |              |                 |              |                 |
| <b>Practical Marks</b>                               | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>50 Marks</b></td> </tr> </table>  | Attendance      | 05 marks | Practical Exam | 20 marks | Viva   | 10 marks | Journal   | 10 marks | Discipline   | 05 marks        | <b>Total</b> | <b>50 Marks</b> |
|  | Attendance   | 05 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Practical Exam   | 20 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Viva   | 10 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Journal  | 10 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
|  | Discipline   | 05 marks        |          |                |          |  |          |   |          |              |                 |              |                 |
| <b>Total</b>   | <b>50 Marks</b>  |                 |          |                |          |  |          |   |          |              |                 |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 1    | 1    | 0    | 1    |
| CO2 | 2    | 1    | 0    | 2    | 1    | 0    |
| CO3 | 2    | 2    | 2    | 1    | 1    | 0    |
| CO4 | 1    | 2    | 2    | 1    | 0    | 1    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |



### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 2   | 2   | 1   | 1   | 1   |
| CO2 | 1   | 2   | 3   | 2   | 1   | 1   |
| CO3 | 3   | 2   | 0   | 1   | 3   | 1   |
| CO4 | 2   | 1   | 3   | 2   | 1   | 0   |
| CO5 | 1   | 0   | 1   | 0   | 0   | 0   |

|                                      |   |                               |
|--------------------------------------|---|-------------------------------|
| <b>COURSE CODE</b><br><b>BCCA302</b> | <b>COURSE NAME</b><br><b>Data Structure and Algorithm</b> | <b>SEMESTER</b><br><b>III</b> |
|--------------------------------------|---|-------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 30        | 0        | 60          | 2               | 1         | 0        | 3            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | None  |
| <b>Course Category</b>                             | Major   |
| <b>Course focus</b>                                | Employability   |
| <b>Rationale</b>                                   | This course provides the basic idea about the structures, operations on them, and also gives insights as to how to sort them using different techniques.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> Fundamentals of data structures.<br>2: <b>Understand the</b> Basic concepts related to stacks, queues.<br>3: <b>Apply</b> basic concepts related to trees and linked lists<br>4: <b>Understand and Apply</b> the fundamentals of sorting and searching techniques<br>5: <b>understand</b> the concepts related to file organization |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Introduction to Data Structures</b><br>– Introduction to data structures - Definition, Types of Data Structures, applications and advantages<br>– Primitive and non-primitive data structures and operations on them<br>– Introduction to arrays, one and two-dimensional arrays<br>– Representation of arrays in memory : row-major and column-major order<br>– Address calculation of elements of one and two-dimensional arrays<br>– Applications of arrays | 15%       | 4             |
| <b>Unit 2: Stack</b><br>– Introduction<br>– Operations on the Stack- Push, Pop, Peep, Change<br>– Applications of Stack   | 25%       | 8             |



|  |     |   |
|--|-----|---|
| <ul style="list-style-type: none"> <li>– Infix, Postfix, Prefix Notations</li> <li>– Conversion: Infix to Postfix</li> <li>– Recursion : Definition and examples</li> </ul> <p><b>Queues</b></p> <ul style="list-style-type: none"> <li>– Types of queues : Simple queues, Circular queues, Double ended queues, Priority Queue</li> <li>– Applications of Queues</li> <li>– Operations on Simple and Circular Queues : Insert and Delete</li> </ul>   |     |   |
| <p><b>Unit 3: Introduction to trees</b></p> <ul style="list-style-type: none"> <li>– Definitions of basic terms : Tree, Directed Tree, Root, Leaf, Branch, Level, Node, Forest</li> <li>– Applications of a tree</li> <li>– Binary trees : introduction, linear and linked representations</li> <li>– Traversal of a binary tree: Preorder, Inorder and Postorder (Recursive)</li> <li>– Insertions and deletions in a lexically ordered binary tree</li> <li>– Types of Binary Tree : Full Binary Tree, Complete Binary Tree, Binary Search Tree</li> </ul> | 30% | 9 |
| <p><b>Unit 4: Linked List</b></p> <ul style="list-style-type: none"> <li>– Introduction to linked lists</li> <li>– Types of linked lists: Singly linked lists, Doubly linked lists, Circular linked lists, Circular Doubly linked list</li> <li>– Operations on Singly Linked Lists:</li> <li>– Insertion: At Front, At Any Position, At End</li> <li>– Deletion: From Beginning, From Any Position, From End</li> </ul>   | 15% | 5 |
| <p><b>Unit 5: Sorting and Searching techniques</b></p> <ul style="list-style-type: none"> <li>– Sorting – Introduction, Applications of sorting</li> <li>– Sorting Techniques - Bubble Sort, Quick Sort and Merge Sort</li> <li>– Searching – Introduction, Applications of searching</li> <li>– Searching Techniques - Sequential search and Binary search</li> <li>– Sorting vs. searching</li> </ul>  | 15% | 4 |

| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Study of Digital Number System & Its Significance                   | 7%        | 2             |
| 2. Study of Logic Gates (Buffer, AND, OR, NOT EXOR, EXNOR, NAND & NOR) | 7%        | 2             |
| 3. Study of Adder circuit  | 7%        | 2             |
| 4. Study of Subtrator circuit  | 7%        | 2             |
| 5. Study of Parity Bit Generator                                       | 13%       | 4             |
| 6. Study of Sequential logic & Flip Flops                              | 13%       | 4             |
| 7. Study of 4 Bit - Universal Shift Register                           | 7%        | 2             |
| 8. Study of Bi-Directional Counter                                     | 13%       | 4             |
| 9. Study of 8- Bit ADC (Analog to Digital Converter)                   | 13%       | 4             |
| 10. Study of CMOS Technology & Its Significance in Digital Electronics | 13%       | 4             |

**Instructional Method and Pedagogy:** Chalk-board, discussions, quizzes, online materials, Hands-on sessions, Blended learning approach incorporating usage of ICT tools

| Course Outcomes:  | Blooms' Taxonomy Domain     | Blooms' Taxonomy Sub Domain        |
|---|-----------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:            |                             |                                    |
| CO1. <b>Understand</b> Fundamentals of data structures.                               | Remember, Understand, Apply | Define, State, Discuss, Solve, Use |
| CO2. <b>Develop and understand</b> the Basic concepts related to stacks, queues       | Understand, Apply           | Solve, Use                         |
| CO3. <b>Understand</b> the basic concepts related to trees and linked lists.          | Understand                  | Solve, Use, Compare, Examine       |
| CO4. <b>Understand and apply</b> the fundamentals of sorting and searching techniques | Understand, Apply           | Discuss, Classify, Solve, Use      |
| CO5. <b>Understand and apply</b> the concepts of searching techniques.                | Understand, apply           | Discuss, Classify, Explain         |

| <b>Learning Resources</b> |  |
|---------------------------|--|
| 1.                        | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Tremblay J. &amp; Sorenson P. G.: An Introduction to Data Structures with Applications, 2nd Edition, Tata McGraw-Hill Edition, 1991.</li> <li>2. Singh Bhagat &amp; Naps Thomas: Introduction to Data Structures, Tata McGraw-Hill Publishing Co.Ltd.,1985.</li> </ol> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. R. B. Patel: Data Structure using C – Khanna Publications. ISBN: 81-87522-41-0</li> <li>2. D. Samanta - Classis Data Structures, 2nd Edition – PHI Publication.</li> <li>3. G. S. Baluja - Data Structures through C, 4th Edition – Dhanpat Rai &amp; Co.</li> </ol> |
| 2.                        | Journals & Periodicals:  |
| 3.                        | <p>Other Electronic Resources:</p> <ol style="list-style-type: none"> <li>1. <a href="https://www.tutorialspoint.com/">https://www.tutorialspoint.com/</a></li> <li>2. <a href="https://www.w3schools.com/">https://www.w3schools.com/</a></li> <li>3. <a href="https://www.javatpoint.com/">https://www.javatpoint.com/</a></li> </ol>  |

| <b>Evaluation Scheme</b>                             | <b>Total Marks</b>   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
|--|--|------------|----------|----------------|----------|----------------------|----------|----------------|----------|--------------|-----------------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tbody> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </tbody> </table>                                     | Attendance | 05 marks | MCQs           | 10 marks | Open Book Assignment | 15 marks | Article Review | 10 marks | <b>Total</b> | <b>40 Marks</b> |              |                 |
| Attendance   | 05 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| MCQs   | 10 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Open Book Assignment                                 | 15 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Article Review                                       | 10 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Practical Marks</b>                               | <table border="1"> <tbody> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>50 Marks</b></td> </tr> </tbody> </table> | Attendance | 05 marks | Practical Exam | 20 marks | Viva                 | 10 marks | Journal        | 10 marks | Discipline   | 05 marks        | <b>Total</b> | <b>50 Marks</b> |
| Attendance   | 05 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Practical Exam                                       | 20 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Viva   | 10 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Journal  | 10 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| Discipline   | 05 marks   |            |          |                |          |                      |          |                |          |              |                 |              |                 |
| <b>Total</b>   | <b>50 Marks</b>  |            |          |                |          |                      |          |                |          |              |                 |              |                 |



### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 3    | 2    | 1    | 0    | 2    | 1    |
| CO2 | 2    | 3    | 1    | 0    | 2    | 1    |
| CO3 | 2    | 1    | 3    | 2    | 2    | 0    |
| CO4 | 3    | 2    | 1    | 2    | 0    | 1    |
| CO5 | 1    | 2    | 0    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3   | 2   | 2   | 0   | 2   | 1   |
| CO2 | 2   | 1   | 1   | 0   | 2   | 1   |
| CO3 | 2   | 1   | 3   | 2   | 1   | 0   |
| CO4 | 3   | 2   | 1   | 2   | 0   | 1   |
| CO5 | 1   | 0   | 0   | 0   | 0   | 1   |

|                                      |  |                               |
|--------------------------------------|--|-------------------------------|
| <b>COURSE CODE</b><br><b>BCCA303</b> | <b>COURSE NAME</b><br><b>Server Side Scripting</b> | <b>SEMESTER</b><br><b>III</b> |
|--------------------------------------|--|-------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 30        | 0        | 75          | 3               | 1         | 0        | 4            |

|  |  |
|--|--|
| <b>Course Pre-requisites</b>                           | None   |
| <b>Course Category</b>                                 | Major  |
| <b>Course focus</b>                                    | Skill development  |
| <b>Rationale</b>                                       |  |
| <b>Course Revision/<br/>Approval Date:</b>             |  |
| <b>Course Objectives<br/>(As per Blooms' Taxonomy)</b> | <p>To enable the student to:</p> <ol style="list-style-type: none"> <li>1: <b>Provide</b> students the fundamental concepts related to PHP programming.</li> <li>2: <b>Understand and remember</b> basic knowledge of working with advanced features of PHP and interaction with forms</li> <li>3: Provide basic <b>understanding</b> of database access.</li> <li>4: Give <b>brief</b> idea about programming using PHP</li> <li>5: gain <b>knowledge</b> about file handling.</li> </ol> |

| <b>Course Content (Theory)</b>  | <b>Weightage</b> | <b>Contact hours</b> |
|---|------------------|----------------------|
| <b>Unit 1: Introduction to PHP</b><br>– History of PHP, Features Merits and Demerits of PHP, General structure of PHP, Displaying Output, Escaping Special Characters, Comments, Variables – (Declaring, Assigning, Destroying),<br>– Datatypes, Setting and Testing Datatypes, Constants, Operators (Arithmetic, Comparison, Logical, Assignment, Concatenation) – Superglobal variables | 20%              | 9                    |

|   |     |   |
|---|-----|---|
| <b>Unit 2: PHP Basics</b><br>– Control structures – Looping structures<br>– 1-D Array & its manipulation (Storing Data, Assigning, Accessing Array Elements, Displaying)<br>– User-Defined Functions, Function Scope  | 20% | 9 |
| <b>Unit 3: Advanced PHP and Form Interaction</b><br>– Working with Number, Strings functions, Working with Dates and Time<br>– Creating tables using PhpMyAdmin, Interaction with HTML form, Validating HTML Form<br>– Error checking or Exiting – Introduction to Regular Expression,<br>– File handling | 20% | 9 |
| <b>Unit 4: Database programming and PHP</b><br>– Introduction to MySQL: Features, Merits and Demerits<br>– MySQL data types and constraints<br>– Working with Forms PHP and MySQL Integration<br>– Basic SQL Commands (Insert, Update, Delete, Select)  | 20% | 9 |
| <b>Unit 5: Database programming and PHP</b><br>– MySQL functions (mysql_connect, mysql_select_db, mysql_query,<br>mysql_num_rows, mysql_fetch_array, mysql_fetch_field, mysql_close) -- - Generating reports using PHP and MySQL<br>- Introduction and use of Session - Introduction and use of Cookies   | 20% | 9 |

| List Of Practical | Weightage | Contact hours |
|-------------------|-----------|---------------|
| 1                 |           |               |
| 2                 |           |               |
| 3                 |           |               |
| 4                 |           |               |
| 5                 |           |               |
| 6                 |           |               |
| 7                 |           |               |
| 8                 |           |               |
| 9                 |           |               |
| 10                |           |               |

**Instructional Method and Pedagogy:** Blended learning approach incorporating traditional

classroom teaching and online /ICT-based teaching practices.

| Course Outcomes:   | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain |
|--|-------------------------|-----------------------------|
| After successful completion of the above course, students will be able to:                             | Cognitive Domain        |                             |
| CO1: <b>Understanding</b> of the fundamental concepts related to PHP programming..                     |                         | Understand                  |
| CO2: <b>Apply</b> basic knowledge of working with advanced features of PHP and interaction with forms. |                         | Apply                       |
| CO3: <b>Understanding</b> of database access in PHP..  |                         | Understand                  |
| CO4: <b>Analyse</b> working of database programming  |                         | Analyse                     |
| CO5: Students will be able to <b>develop</b> reports using PHP.  |                         | Apply                       |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. PHP – A Beginner's guide, Vikram Vaswani, TMH, 2009.</li> <li>2. Web enabled commercial application development using HTML, Javascript, DHTML and PHP by Ivan Bayross, BPB Publication, 2010.</li> <li>3. Beginning PHP5 By Dave Mercer, Allan Kent, Steven Nowicki, David Mercer, DanSquier, Wankyu Choi, Wrox Publication, 2004.</li> <li>4. Professional PHP by Castagnetto Jesus, Shroff Publication, 1999.</li> </ol> |
| 2.                 | Journals & Periodicals:  |
| 3.                 | Other Electronic Resources:  |

| Evaluation Scheme                 | Total Marks |
|-----------------------------------|-------------|
| <b>Theory: Mid semester Marks</b> | 20 marks    |
| <b>Theory: End Semester Marks</b> | 40 marks    |

|  |  |                 |
|--|--|-----------------|
| <b>Theory: Continuous Evaluation Component Marks</b> | Attendance   | 05 marks        |
|  | MCQs   | 10 marks        |
|  | Open Book Assignment/Presentation / miscellaneous activities / Project | 15 marks        |
|  | Skill enhancement activities / case study / Lab Submissions            | 10 marks        |
|  | <b>Total</b>   | <b>40 Marks</b> |
| <b>Practical Marks</b>                               | Attendance   | 05 marks        |
|  | Practical Exam   | 20 marks        |
|  | Viva   | 10 marks        |
|  | Journal  | 10 marks        |
|  | Discipline   | 05 marks        |
|  | <b>Total</b>   | <b>50 Marks</b> |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 3    | 0    | 2    | 1    |
| CO2 | 2    | 1    | 1    | 0    | 2    | 1    |
| CO3 | 2    | 2    | 3    | 2    | 1    | 0    |
| CO4 | 3    | 2    | 1    | 1    | 0    | 1    |
| CO5 | 1    | 0    | 1    | 0    | 0    | 1    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

|                                      |  |                               |
|--------------------------------------|--|-------------------------------|
| <b>COURSE CODE</b><br><b>BCCA304</b> | <b>COURSE NAME</b><br><b>Computer Networks</b> | <b>SEMESTER</b><br><b>III</b> |
|--------------------------------------|--|-------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |   |
|--|---|
| <b>Course Pre-requisites</b>                       | None  |
| <b>Course Category</b>                             | Major   |
| <b>Course focus</b>                                | Skill development   |
| <b>Rationale</b>                                   |   |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Remember, Understand</b> the basics of Networking and its components.<br>2: <b>Understand</b> and <b>Use</b> the data transmission technology.<br>3: <b>Understand and Remember</b> the impairment in data transmission<br>4: <b>Remember, Understand and Apply</b> the features of Networking.<br>5: <b>Apply</b> the knowledge of transmission in different media. |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>Unit 1: Basics of Networking:</b> Introduction of networking (Definition) - Advantages and Disadvantages of Networking - LAN, MAN, WAN - LAN Components - OSI model             | 20%       | 6             |
| <b>Unit 2: Transmission Technology:</b> Digital and Analog Transmission - Transmission mode (Half Duplex and Full Duplex Transmission), Serial Transmission, Parallel Transmission | 20%       | 6             |
| <b>Unit 3: Transmission Technology:</b> Synchronous & Asynchronous Transmission - Transmission Impairment (Attenuation, distortion, Noise)   | 20%       | 6             |
| <b>Unit 4: Topology and Protocols:</b> LAN Topologies (Bus, Star, Ring, Tree, Mesh, Intersecting Rings) – Protocols (Definition), Need of Protocols - Protocols (CSMA/CD, CSMA/CA) | 20%       | 6             |
| <b>Unit 5: Networking Media and Devices:</b> Types of transmission media - Guided Media - (Twisted pair cables,  | 20%       | 6             |

Coaxial Cables, Optical fibers), Devices - Hubs, Switches, Bridges, Routers, Gateways, Modems

**Instructional Method and Pedagogy:** Chalk & board, group discussions, assignments, Presentations, Quiz.

| Course Outcomes:  | Blooms' Taxonomy Domain    | Blooms' Taxonomy Sub Domain                                |
|---|----------------------------|--|
| After successful completion of the above course, students will be able to:      |                            |  |
| CO1. <b>Understand and remember</b> the concepts of networking.                 | Remember, Understand,      | Define, State, classify, Explain, Identify, Use,           |
| CO2. <b>Use</b> the technology in transmission of data.                         | Understand, Apply          | Describe, Identify, Solve, Use, Find                       |
| CO3. <b>Understand and analyze</b> the impairment in transmission               | Understand, Analyze        | classify, Explain, Identify, Use, Solve, Organize, Examine |
| CO4. <b>Apply</b> various features of networking to solve the networking model. | Understand, Apply, Analyze | classify, Explain, Identify, Use, Solve, Organize, Examine |
| CO5. <b>Use</b> the transmission knowledge in various media.                    | Understand, Apply          | classify, Explain, Identify, Use, Solve, Organize, Examine |

| Learning Resources |   |
|--------------------|---|
| 1.                 | <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>B. A. Forouzan: Data Communications and Networking 2nd Edition, TMH</li> <li>Andrew S Tannenbaum: Computer Networks, 3rd Ed., Pearson-Prentice Hall</li> <li>B. A. Forouzan: Local Area Networks, TMH</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Tanenbaum A. S., computer networks, 3rd edition prentice-hall of India Pvt. Ltd., New Delhi, 1997.</li> </ol> |
| 2.                 | Journals & Periodicals:   |
| 3.                 | Other Electronic Resources:   |

| Evaluation Scheme                 | Total Marks |
|-----------------------------------|-------------|
| <b>Theory: Mid semester Marks</b> | 20 marks    |
| <b>Theory: End Semester Marks</b> | 40 marks    |



|  |  |                     |
|--|--|---------------------|
| <b>Theory: Continuous Evaluation Component Marks</b> | Attendance   | 05<br>marks         |
|  | MCQs   | 10<br>marks         |
|  | Open Book Assignment   | 15<br>marks         |
|  | Article Review / Skill enhancement activities / Practice Assignments | 10<br>marks         |
|  | <b>Total</b>   | <b>40<br/>Marks</b> |

**Mapping of PSOs & COs**

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 3    | 1    | 0    | 0    |
| CO2 | 2    | 2    | 2    | 2    | 1    | 1    |
| CO3 | 2    | 2    | 1    | 1    | 1    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 1    |
| CO5 | 2    | 1    | 0    | 0    | 0    | 0    |

**Mapping of POs & COs**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 1   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 1   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 1   |
| CO5 | 0   | 0   | 1   | 1   | 0   | 0   |

|                                      |   |                               |
|--------------------------------------|---|-------------------------------|
| <b>COURSE CODE</b><br><b>BCCA305</b> | <b>COURSE NAME</b><br><b>Graph Theory</b> | <b>SEMESTER</b><br><b>III</b> |
|--------------------------------------|---|-------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 15       | 45          | 2               | 0         | 1        | 3            |

|  |   |
|--|---|
| <b>Course Prerequisites</b>                        | Student should have cleared 12th Science  |
| <b>Course Category</b>                             | Minor   |
| <b>Course focus</b>                                | Skills Development  |
| <b>Rationale</b>                                   | The present course impart the knowledge of different types of Graph and its properties. Also students will understand the importance of having graphical interpretation of problem statement to solve it using properties of graphs.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand and develop</b> the fundamental concepts of Graph Theory<br>2: <b>Understand and apply</b> knowledge to analyze models of Graph Theory<br>3: <b>Apply</b> the standard algorithms and solve problems of Graph Theory<br>4. <b>Understand</b> the applications of Graphs theory concepts.<br>5. <b>Understand and analyse</b> the applications of graph theory |

| Course Content (Theory)   | Weightage  | Contact hours |
|---|------------|---------------|
| <b>Unit 1:</b><br>Elementary properties of graphs, Applications of graphs, Isomorphism of graphs, Sub-graphs, Walks, Paths and circuits         | <b>20%</b> | 6             |
| <b>Unit 2:</b><br>Konigsberg bridge problem, Connected graphs, disconnected graphs and components, Euler graphs, Hamiltonian circuits           | <b>20%</b> | 6             |
| <b>Unit 3:</b><br>Definition and properties of tree, Centers in a tree, Rooted and Binary tree, Spanning trees                                  | <b>20%</b> | 6             |
| <b>Unit 4:</b><br>Fundamental circuits, cut set and its properties , Planar graphs and Kuratowski's two graphs, Representation of planar graphs | <b>20%</b> | 6             |

|   |            |          |
|---|------------|----------|
| <b>Unit 5:</b><br>Geometric dual, combinatorial dual,<br>Vertex colouring: Chromatic number-Brook's Theorem | <b>20%</b> | <b>6</b> |
|---|------------|----------|

| <b>List of Tutorial</b>   | <b>Weightage</b> | <b>Contact hours</b> |
|---|------------------|----------------------|
| <b>Unit 1:</b> Examples based on Isomorphism of graphs, Sub-graphs, Walks, Paths and circuits | <b>20%</b>       | <b>2</b>             |
| <b>Unit 2:</b> Examples based on types of graphs and circuits                                 | <b>20%</b>       | <b>2</b>             |
| <b>Unit 3:</b> Examples based on Spanning trees, Binary trees                                 | <b>20%</b>       | <b>2</b>             |
| <b>Unit 4:</b> Examples based on Planner and non-planner graphs                               | <b>18%</b>       | <b>4</b>             |
| <b>Unit 5:</b> Examples based Colouring of graphs   | <b>22%</b>       | <b>5</b>             |

**Instructional Method and Pedagogy:** Classroom Lecture, Case Studies, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>   | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b>       |
|---|--------------------------------|--|
| After successful completion of the above course, students will be able to:              |                                |  |
| CO1: <b>Understand and remember</b> the fundamentals of Graph theory                    | Understand, Analyse, Remember  | Define, Classify & Demonstrate           |
| CO2: <b>Understand and analyze</b> the different types of graphs and its properties.    | Analyse, Understand            | Classify, Describe & Demonstrate         |
| CO3: <b>Understand and remember</b> the fundamentals of structures of Graphs.           | Understand, remember           | Define, Describe & Demonstrate           |
| CO4: <b>Understand and apply</b> the concepts of Graph theory to solve the problems.    | Understand, Analyse            | Define Describe                          |
| CO5: <b>Apply</b> the concepts of colouring to understand the problems of graph theory. | Understand, Apply              | Define, Classify, Describe & Demonstrate |

| <b>Learning Resources</b> |  |
|---------------------------|--|
| 1.                        | <p><b>Text books:</b></p> <ol style="list-style-type: none"> <li>J. P. Trembley and R. Manohar, Discrete Mathematical Structure with applications to Computer Science, McGraw Hill Book Company, 2001.</li> <li>NarsinghDeo, Graph theory with applications to Engineering and Computer Science, Prentice-Hall of India, 1993.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Graph Theory with Applications by J.A.Bondy and U.S.R.Murty, The Macmillan Press Ltd, (1976)</li> <li>Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with</li> </ol> |

|    |   |
|----|---|
|    | Graph Theory, 2nd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint 2003 |
| 2. | <b>Journals &amp; Periodicals:</b>  |
| 3. | <b>Other Electronic Resources:</b>  |

| Evaluation Scheme                                    | Total Marks  |                 |          |      |          |                      |          |   |          |              |                 |
|--|--|-----------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |                 |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |                 |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance      | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance   | 05 marks        |          |      |          |                      |          |   |          |              |                 |
|  | MCQs   | 10 marks        |          |      |          |                      |          |   |          |              |                 |
|  | Open Book Assignment   | 15 marks        |          |      |          |                      |          |   |          |              |                 |
|  | Article Review / Skill enhancement related activities  | 10 marks        |          |      |          |                      |          |   |          |              |                 |
|  | <b>Total</b>   | <b>40 Marks</b> |          |      |          |                      |          |   |          |              |                 |

#### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 1    |
| CO2 | 1    | 1    | 0    | 2    | 0    | 0    |
| CO3 | 2    | 1    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 1    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 1    |

#### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

|                               |   |                        |
|-------------------------------|---|------------------------|
| <b>COURSE CODE</b><br>AECC301 | <b>COURSE NAME</b><br>Indian Constitution | <b>SEMESTER</b><br>III |
|-------------------------------|---|------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |   |
|--|---|
| <b>Course Prerequisites</b>                        | No  |
| <b>Course Category</b>                             | Ability Enhancement course  |
| <b>Course focus</b>                                | This course offers comprehensive knowledge about Indian constitution.   |
| <b>Rationale</b>                                   |   |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> fundamentals of Indian Constitution.<br>2: <b>Understand</b> the framework of Indian Constitution.<br>3: <b>Remember</b> the role of government of the union<br>4. <b>Remember</b> the role of the state government.<br>5. <b>Understand</b> the administration organization. |

| Course Content (Theory)   | Weightage  | Contact hours |
|---|------------|---------------|
| <b>Unit 1: Constitution – Strategies and Principles:</b><br>1. Meaning and important of constitution<br>2. Making of Indian constitution – sources<br>3. Salient Features of Indian constitution.   | <b>20%</b> | 6             |
| <b>Unit 2: Fundamental Rights and Directive Principles</b><br>1. Fundamental Rights<br>2. Fundamental Duties<br>3. Directive Principles   | <b>27%</b> | 8             |
| <b>Unit 3: Government of the Union</b><br>1. President of India – Election and powers<br>2. Prime Minister and council of ministers<br>3. Lok Sabha – composition and Powers<br>4. Rajya Sabha – Composition and Powers.  | <b>20%</b> | 6             |
| <b>UNIT 4: Government of the States &amp; The Judiciary</b><br>1. Governor – Powers<br>2. Chief Minister and Council of ministers<br>3. Legislative Assembly – Composition and Powers<br>4. Legislative Council – Composition and Powers<br>5. Features of judiciary system in India<br>6. Supreme Court – Structure and Jurisdiction | <b>20%</b> | 6             |

|  |            |          |
|--|------------|----------|
| <b>Unit 5: Administrative Organization and Constitution</b><br>1. Federalism in India – features<br>2. Local Government – Panchyats and Powers and functions<br>73rd and 74th Amendments<br>3. Election Commission – Organization and functions<br>Citizen Oriented Measure – RTI and PIL – Provisions and Significance. | <b>13%</b> | <b>4</b> |
|--|------------|----------|

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|--|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to: |                                |                                    |
| 1: <b>Understand</b> importance of Indian Constitution.                    | Understand, Remember           | Define, Classify                   |
| 2: <b>Understand</b> the rights and duties of Indian citizens.             | Understand                     | Classify, Describe                 |
| 3: <b>Remember and Understand</b> the government of the union              | Understand, remember           | Define, Describe                   |
| 4. <b>Remember</b> the role of the state government.                       | Understand                     | Define Describe                    |
| 5. <b>Understand</b> the administration organization.                      | Understand, Apply              | Define, Classify                   |

| <b>Learning Resources</b> |   |
|---------------------------|---|
| 1.                        | <b>Text books:</b><br>1. Introduction to the constitution of India, Durga Das Basu LexisNexis<br><b>Reference Books:</b><br>1. Indian's Constitution by M.V. Pylee , New Delhi S. Chand Publication<br>2. The Constitutional Law of India by J.N. Panday Allahabad Central Law Agency |
| 2.                        | <b>Journals &amp; Periodicals:</b>  |
| 3.                        | <b>Other Electronic Resources:</b><br>1. Constitution of India by National Portal of India<br><a href="https://www.india.gov.in/sites/upload-files/coi_part_full.pdf">https://www.india.gov.in/sites/upload-files/coi_part_full.pdf</a>   |

| <b>Evaluation Scheme</b>          | <b>Total Marks</b> |
|-----------------------------------|--------------------|
| <b>Theory: Mid semester Marks</b> | 20 marks           |
| <b>Theory: End Semester Marks</b> | 40 marks           |

|  |   |                 |
|--|---|-----------------|
| <b>Theory: Continuous Evaluation Component Marks</b> | Attendance  | 05 marks        |
|  | MCQs  | 10 marks        |
|  | Open Book Assignment                                  | 15 marks        |
|  | Article Review / Skill enhancement related activities | 10 marks        |
|  | <b>Total</b>  | <b>40 Marks</b> |

**Mapping of PSOs & COs**

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO2 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO3 | 2    | 2    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 0    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |

**Mapping of POs & COs**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

*School of Science  
BCA, Course Curriculum  
Academic Year, 2023-24*



# Semester - IV

**Summary of Credits:**

| Sr. No. | Semester | Course Code | Course Name                            | Theory marks | Practical marks | Course Credit |
|---------|----------|-------------|--|--------------|-----------------|---------------|
| 1       | IV       | BCCA401     | Operating Systems                      | 100          | 50              | 4             |
| 2       | IV       | BCCA402     | Introduction to AI ML                  | 100          | 0               | 4             |
| 3       | IV       | BCCA403     | Object Oriented Programming using JAVA | 100          | 50              | 4             |
| 4       | IV       | BCCA404     | Cyber Law & Ethics                     | 100          | 0               | 2             |
| 5       | IV       | BCCA405     | Graph Theory                           | 100          | 50              | 3             |
| 6       | IV       | AECC401     | Environmental Science                  | 100          | 0               | 2             |
| 7       |          |             |  |              |                 |               |
|         |          |             | <b>Total</b>                           | <b>600</b>   | <b>150</b>      | <b>19</b>     |

|                               |  |                       |
|-------------------------------|--|-----------------------|
| <b>COURSE CODE</b><br>BCCA401 | <b>COURSE NAME</b><br>Operating System | <b>SEMESTER</b><br>IV |
|-------------------------------|--|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 15        | 0        | 45          | 2               | 1         | 0        | 3            |

|  |  |
|--|--|
| <b>Course Prerequisites</b>                        | Basic Computer Knowledge   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Skill Development  |
| <b>Rationale</b>                                   | The course provides concepts that underlie all operating systems not tied to any particular operating system. The emphasis is done to explain the need and structure of an operating system using its common services such as process management (creation, termination etc.), CPU scheduling, Process Synchronization, Handling Deadlocks, main memory management, virtual memory, secondary memory management. The course also introduces various scheduling algorithms and structures/techniques operating systems use to provide these services. |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | On successful completion of the course, students will be able to:<br>1. Understand the need of an Operating System & Define Multiprogramming and Multithreading concepts.<br>2. Implement Process Synchronization service (Critical Section, Semaphores), CPU scheduling service with various algorithms.<br>3. Learn Main memory Management (Paging, Segmentation) algorithms, Handling of Deadlocks<br>4. Identify and appreciate the File systems Services, Disk Scheduling service   |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <p><b>Unit 1 Introduction:</b><br/>Operating Systems (OS) definition and its purpose, Multiprogrammed and Time Sharing Systems, OS Structure, OS Operations: Dual and Multi-mode, OS as resource manager</p>   | 15%       | 5             |
| <p><b>Unit 2 Operating System Structures:</b><br/>OS Services, System Calls: Process Control, File Management, Device Management, and Information Maintenance, Inter-process Communication, and Protection, System programs, Sstructure-Simple, Layered, Microkernel, and Modular.</p>   | 20%       | 6             |
| <p><b>Unit 3 Process Management:</b><br/>Process Concept, States, Process Control Block, Process Scheduling, Schedulers, Context Switch, Operation on processes, Threads, Multicore Programming, Multithreading Models, PThreads, Process Scheduling Algorithms: First Come First Served, Shortest-Job-First, Priority &amp; Round-Robin, Process Synchronization: The critical-section problem and Peterson's Solution, Deadlock characterization, Deadlock handling.</p> | 30%       | 8             |
| <p><b>Unit 4 Memory Management:</b><br/>Physical and Logical address space, Swapping, Contiguous memory allocation strategies - fixed and variable partitions, Segmentation, Paging. Virtual Memory Management: Demand Paging and Page Replacement algorithms: FIFO Page Replacement, Optimal Page replacement, LRU page replacement</p>   | 20%       | 6             |
| <p><b>Unit 5 File System:</b><br/>File Concepts, File Attributes, File Access Methods, Directory Structure: Single-Level, Two-Level, Tree-Structured, and Acyclic-Graph Directories.<br/>Mass Storage Structure: Magnetic Disks, Solid-State Disks, Magnetic Tapes, Disk Scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, and C-LOOK Scheduling.</p>   | 15%       | 5             |



| List Of Practical  | Weightage | Contact hours |
|--|-----------|---------------|
| 1. Execute various LINUX commands for:<br>i. InformationMaintenance:wc,clear,cal,who,date,pwd<br>ii. FileManagement:cat,cp,rm,mv,cmp,comm,diff,find,grep,awk<br>iii. DirectoryManagement:cd,mkdir,rmdir,ls                           | 5%        | 1             |
| 2. Execute various LINUX commands for:<br>i. Process Control: fork, getpid, ps, kill, sleep<br>ii. Communication: Input-output redirection, Pipe<br>iii. Protection Management: chmod, chown, chgrp                                  | 5%        | 1             |
| 3. Writeaprogram(usingfork()and/orexec()commands)wher<br>eparentandchild execute:<br>i. same program, same code.<br>ii. sameprogram,differentcode.<br>iii. before terminating, the parent waits for the child to finish<br>its task. | 10%       | 1             |
| 4. Write a program to to report behaviour of Linux kernel<br>including kernel version, CPU type and model. (CPU<br>information)  | 10%       | 1             |
| 5. WriteaprogramtoreportbehaviourofLinuxkernelinclu<br>dinginformationon19 configured memory, amount of free<br>and used memory. (Memory information)  | 10%       | 1             |
| 6. Writeaprogramtocopyfilesusingsystemcalls.   | 10%       | 1             |
| 7. WriteaprogramtoimplementFCFSSchedulingalgorithm.  | 10%       | 1             |
| 8. WriteaprogramtoimplementSJFSchedulingalgorithm.   | 10%       | 1             |
| 9. Writeaprogramtoimplementnon-preemptiveprioritybased<br>schedulingalgorithm.   | 10%       | 1             |
| 10. WriteaprogramtoimplementSRTFSchedulingalgorithm.   | 10%       | 2             |
| 11. WriteaprogramtocalculatesumofnnumbersusingPthreads.<br>Alistofnnumbersis divided into two smaller list of equal size,<br>two separate threads are used to sum the sublists.  | 10%       | 2             |
| 12. Writeaprogramtoimplementfirst-fit,best-fitandworst-fitall<br>ocationstrategies   | 10%       | 2             |
|  |           |               |

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions, Project based learning

| Course Outcomes:  | Blooms' Taxonomy Domain | Blooms' Taxonomy Sub Domain     |
|---|-------------------------|---------------------------------|
| After successful completion of the above course, students will be able to:              |                         |                                 |
| <b>CO1:</b> Understand basic technical differences between different operating systems. | Understand, Remember    | Define, Classify                |
| <b>CO2:</b> Analyse how command line argument works.                                    | Understand              | Classify, Describe              |
| <b>CO3:</b> Perform different processes at the same time.                               | Understand, remember    | Define, Describe, Find          |
| <b>CO4:</b> Apply memory management in real time applications.                          | Understand, Apply       | Define Describe, Find, Evaluate |
| <b>CO5:</b> Understand scheduling of different processes based on priority.             | Understand, Apply       | Define, Classify, Find          |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <b>Text books:</b> <ol style="list-style-type: none"> <li>Silberschatz, A., Galvin, P. B., Gagne G. <i>Operating System Concepts</i>, 9<sup>th</sup> edition, JohnWiley Publications,2016</li> <li>Dhamdhare,D.M.,<i>OperatingSystems: AConcept-basedApproach</i>,2<sup>nd</sup>edition,Tata McGraw-Hill Education, 2017</li> <li>Kernighan,B. W.,RobPike,R.<i>TheUnixProgrammingEnvironment</i>,Englewood Cliffs, NJ: Prentice-Hall, 1984.</li> <li>Stallings,W.<i>OperatingSystems: InternalsandDesignPrinciples</i>,9<sup>th</sup>edition,Pearson Education, 2018</li> <li>Tanenbaum,A.S.<i>ModernOperatingSystems</i>,3<sup>rd</sup>edition,PearsonEducation,2007</li> </ol> |
| 2.                 | <b>Journals &amp; Periodicals:</b>   |
| 3.                 | <b>Other Electronic Resources:</b>   |

| Evaluation Scheme                                    | Total Marks  |            |          |      |          |                      |          |   |          |              |                 |
|--|--|------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance   | 05 marks   |          |      |          |                      |          |   |          |              |                 |
|  | MCQs   | 10 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Open Book Assignment   | 15 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Article Review / Skill enhancement related activities  | 10 marks   |          |      |          |                      |          |   |          |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |      |          |                      |          |   |          |              |                 |

|                        |                |                 |
|------------------------|----------------|-----------------|
| <b>Practical Marks</b> | Attendance     | 05 marks        |
|                        | Practical Exam | 20 marks        |
|                        | Viva           | 10 marks        |
|                        | Journal        | 10 marks        |
|                        | Discipline     | 05 marks        |
|                        | <b>Total</b>   | <b>50 Marks</b> |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO2 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO3 | 2    | 2    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 0    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

|                                      |  |                              |
|--------------------------------------|--|------------------------------|
| <b>COURSE CODE</b><br><b>BCCA402</b> | <b>COURSE NAME</b><br><b>Introduction to AI ML</b> | <b>SEMESTER</b><br><b>IV</b> |
|--------------------------------------|--|------------------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |  |
|--|--|
| <b>Course Prerequisites</b>                        | No   |
| <b>Course Category</b>                             | Major  |
| <b>Course focus</b>                                | Skill Development  |
| <b>Rationale</b>                                   |  |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> basics of Artificial Intelligence<br>2: <b>Formulate and Solve</b> the search problems efficiently.<br>3: <b>Understand</b> the working of searching algorithm.<br>4: <b>Understand</b> basics of machine learning<br>5: <b>Understand</b> basics of neural networking |

| Course Content (Theory)  | Weightage  | Contact hours |
|--|------------|---------------|
| <b>Unit 1:</b> Definition of AI, birth of AI, brief history, Turing test, Types of environment, Types of agents, PEAS (Performance measure, Environment, Actuators, Sensors)   | <b>20%</b> | 6             |
| <b>Unit 2:</b> Introduction to searching, State Space, SAGP (State, Action, Goal test, Path cost), DFS, BFS (Completeness, Time complexity, Space complexity, Optimality), Heuristics, Local Search Algorithm, Hill Climbing. Applications of Artificial Intelligence in real word.  | <b>20%</b> | 6             |
| <b>Unit 3:</b> Constrain Satisfaction Problems examples, Approaches to solve CSPs, Test and generate method, back tracking. Game Playing, Optimal decision in games, Min Max algorithm, Evaluation functions, Introduction to Propositional Logic and First Order Logic, Syntax, Substitution, Unification, Deduction, Soundness, Completeness, Consistency, Satisfiability, Expert Systems. | <b>27%</b> | 8             |
| <b>Unit 4:</b> Probabilistic Reasoning, Review of Probability Theory, Probabilistic Inference Rules, Bayes Theorem, examples of Bayes theorem, Introduction to Learning, Taxonomy of Learning Systems, Concept Learning, Find-S  | <b>20%</b> | 6             |

|  |            |   |
|--|------------|---|
| algorithm,   |            |   |
| <b>Unit 5:</b> Introduction to Neural Networks, Biological Neural Networks, Artificial Neural Networks, Perceptron, Perceptron Learning Rule, Delta Rule, Applications of Neural Networks. | <b>13%</b> | 4 |

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|--|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:   |                                |                                    |
| <b>CO1: Understand</b> concepts of Artificial Intelligence and different types of intelligent agents and their architecture. | Understand, Remember           | Define, Classify                   |
| <b>CO2: Formulate</b> problems as state space search problem & efficiently <b>solve</b> them                                 | Understand, Apply              | Classify, Describe, Find, Evaluate |
| <b>CO3: Understand</b> the working of various informed and uninformed searching algorithms and different heuristics          | Understand, remember           | Define, Describe                   |
| <b>CO4: Understand</b> concept of knowledge representation, Reasoning with uncertainty and Machine learning algorithms.      | Understand                     | Define Describe                    |
| <b>CO5: Understand</b> how learning happens in neural networks.  | Understand                     | Define, Classify                   |

| <b>Learning Resources</b> |  |
|---------------------------|--|
| 1.                        | <p><b>Text books:</b></p> <ol style="list-style-type: none"> <li>1. Stuart Russell and Peter Norvig – Artificial Intelligence A Modern Approach, PEARSON Education.</li> <li>2. Simon Haykin -Neural Networks PHI.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. N. P. Padhy – Artificial Intelligence and Intelligence Systems, OXFORD publication.</li> <li>2. B. YagnaNarayana - Artificial Neural Networks, PHI</li> </ol>   |
| 2.                        | <b>Journals &amp; Periodicals:</b>   |
| 3.                        | <p><b>Other Electronic Resources:</b></p> <ol style="list-style-type: none"> <li>1. NPTEL Lecture: Prof. SudeshnaSarkar:<br/><a href="http://nptel.ac.in/courses/106105077/">http://nptel.ac.in/courses/106105077/</a></li> <li>2. NPTEL Lecture: Prof. P.Das Gupta:<br/><a href="http://nptel.ac.in/courses/106105079/">http://nptel.ac.in/courses/106105079/</a></li> <li>3. NPTEL Lecture: Prof. Deepak Khemani:<br/><a href="http://nptel.ac.in/courses/106106126/">http://nptel.ac.in/courses/106106126/</a></li> </ol> |

| Evaluation Scheme                                    | Total Marks  |            |          |      |          |                      |          |   |          |              |                 |
|--|--|------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance   | 05 marks   |          |      |          |                      |          |   |          |              |                 |
|  | MCQs   | 10 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Open Book Assignment   | 15 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Article Review / Skill enhancement related activities  | 10 marks   |          |      |          |                      |          |   |          |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |      |          |                      |          |   |          |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO2 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO3 | 2    | 2    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 0    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

|                               |  |                       |
|-------------------------------|--|-----------------------|
| <b>COURSE CODE</b><br>BCCA403 | <b>COURSE NAME</b><br>Object Oriented Programming using JAVA | <b>SEMESTER</b><br>IV |
|-------------------------------|--|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 45                      | 15        | 0        | 60          | 3               | 1         | 0        | 4            |

|  |  |
|--|--|
| <b>Course Prerequisites</b>                            | No   |
| <b>Course Category</b>                                 | Major  |
| <b>Course focus</b>                                    | Skill Development  |
| <b>Rationale</b>                                       |  |
| <b>Course Revision/<br/>Approval Date:</b>             |  |
| <b>Course Objectives<br/>(As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand</b> the core language features of Java and its Application Programming Interfaces<br>2: <b>Prepare</b> applications using the set of powerful java features.<br>3: <b>Analyse and apply</b> a useful real time application.<br>4: Understand building blocks of OOPs language, inheritance, package and interfaces.<br>5: Develop an object oriented program handling a Text file. |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Introduction</b><br>History and Evolution of Java - Features of Java - Object Oriented Concepts – Bytecode - Lexical Issues - Data Types – Variables- Type Conversion and Casting<br><b>Arrays:</b> Operators - Arithmetic Operators - Bitwise - Relational Operators - Assignment Operator - The conditional Operator - Operator Precedence- Control Statements – Arrays. | 25%       | 12            |
| <b>Unit 2:</b> Classes - Objects - Constructors - Overloading method - Static and fixed methods - Inner Classes - String Class.<br><b>Inheritance:</b> Overriding methods - Using super-Abstract class - this keyword – finalize() method – Garbage Collection.   | 22%       | 10            |
| <b>Unit 3:</b> Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws.   | 14%       | 5             |

|   |            |    |
|---|------------|----|
| <b>Unit 4: Threads-</b> The Java Thread Model- Creating a Thread and Multiple Threads - Thread Priorities- Synchronization--Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads - Multithreading. | <b>22%</b> | 10 |
| <b>Unit 5:</b> I/O Streams - File Streams - Applets - String Objects - String Buffer - Char Array.  | 17%%       | 8  |

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>   | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|---|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:  |                                |                                    |
| <b>CO1: Develop</b> the knowledge in programming concepts such as data types, Arrays and Control structures.  | Understand, Remember           | Define, Classify                   |
| <b>CO2:</b> Acquire key skills to <b>apply</b> the major object-oriented concepts to implement object oriented programs in Java using classes and constructors. | Understand, Analyse, Apply     | Classify, Describe, Develop        |
| <b>CO3: Design</b> and built multi-threaded Java Applications. Enhancing the programming skills using additional knowledge in I/O streams                       | Understand, remember, Apply    | Classify, Describe, Develop        |
| <b>CO4: Design</b> and implement Java Applications for real world problems using packages and handle exceptions.  | Understand, Remember, Apply    | Classify, Describe, Develop        |
| <b>CO5: Develop</b> , test, debug and publish real time applications, by taking full advantage of the capabilities of the Java language                         | Understand, Remember, Apply    | Classify, Describe, Develop        |

| <b>Learning Resources</b> |   |
|---------------------------|---|
| 1.                        | <p><b>Text books:</b></p> <ol style="list-style-type: none"> <li>E.Balagurusamy, Programming with Java: A Primer, 2014, 5th Edition, Tata McGraw Hill.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Herbert Schildt, JAVA 2: The Complete Reference, 2011, 8thEdition, McGraw Hill</li> </ol> |
| 2.                        | <b>Journals &amp; Periodicals:</b>  |
| 3.                        | <b>Other Electronic Resources:</b>  |

## SUGGESTED PRACTICAL EXERCISES

| S.No. | Practical Outcomes (PrOs)  |
|-------|--|
| 1     | Install JDK and Setup a Java Programming development environment by using:<br>1) Command Prompt (SET PATH command and using Environment Variable).<br>2) Any open source IDE (Eclipse, Jcreator etc) |
| 2     | Test the java development environment setup by implementing a simple java program (print: "OOP with JAVA").  |
| 3     | Develop a basic java program that demonstrates data types of JAVA.   |
| 4     | Develop a Java program to swap two numbers without using a temporary variable and with using a temporary variable (use command line argument to accept value from user).                             |
| 5     | Develop programs to demonstrate use of -<br>1) if statement and its different form<br>2) switch case statement   |
| 6     | Develop program to demonstrate use of -<br>1) for loop<br>2) 'while' and 'do while' loop   |
| 7     | Develop a Java program to find maximum and minimum numbers from array elements.  |
| 8     | Develop a basic java program that demonstrates the use of Class & Object.  |
| 9     | Develop a java program to find the factorial of a given number using a recursive function.   |
| 10    | Develop a java program that demonstrates method overloading.   |
| 11    | Develop a program for implementation of different functions of String class.   |
| 12    | Develop a program for implementation of Wrapper Class to convert primitive value into object (Boxing) and object into primitive value (Un-boxing).   |
| 13    | Develop a program with a static block and show that it will be executed before the main () method in a class.  |
| 14    | Develop a program to demonstrate use of static functions.  |
| 15    | Develop a program to demonstrate use of 'this' keyword. Check whether 'this' can access the private members of the class or not.   |
| 16    | Develop a program with an overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing object.  |
| 17    | Develop a program to demonstrate the use of private constructor and also write a method which will count the number of instances created using default constructor only.                             |

|    |  |
|----|--|
| 18 | Develop a program to demonstrate single inheritance, multilevel inheritance, and hierarchical inheritance.   |
| 19 | Develop a program with one class named shape which has two member functions named erase () and draw (). In the program we have three other subclasses: circle, triangle and square. override methods of the superclass into subclasses.  |
| 20 | Develop a program for implementation of Dynamic method dispatch.   |
| 21 | Develop a java program that demonstrates the use of Abstract class.  |
| 22 | Develop a java program that illustrates interface inheritance. Interface 'A1' and 'A2' are extended from interface 'A'. Interface 'A12' inherited from both 'A1' and 'A2'. Each interface declares one method and one constant. Class 'Interface_Imple' implements 'A12'. Instantiate 'Interface_Imple' and invoke each of its methods. Each method displays one of the constants. |
| 23 | Develop a program to create a Package and demonstrate how packages are used in java. And use java access modifier to demonstrate the access rules in a package.  |
| 24 | Develop a program to demonstrate the use of 'super' and 'final' keywords.  |
| 25 | Develop programs to demonstrate the use of Exception Handling using predefined Exception Classes.  |
| 26 | Develop a program to handle multiple exceptions using multiple try blocks and multiple catch blocks.   |
| 27 | Develop a program to implement user-defined exceptions.  |
| 28 | Develop a program to demonstrate use of throw, throws, and finally keyword.  |
| 29 | Develop a program that executes two threads. One thread displays "Java Programming" every 2 seconds, and the other displays "Semester-4th" every 5 seconds. (Create the threads by extending the Thread class)   |
| 30 | Develop programs to create, write, modify, read operations on Text files.  |

| Evaluation Scheme                    | Total Marks |
|--------------------------------------|-------------|
| <b>Theory: Mid semester Marks</b>    | 20 marks    |
| <b>Theory: End Semester Marks</b>    | 40 marks    |
| <b>Theory: Continuous Evaluation</b> |             |

|                        |   |                 |
|------------------------|---|-----------------|
| <b>Component Marks</b> | Attendance  | 05 marks        |
|                        | MCQs  | 10 marks        |
|                        | Open Book Assignment                                  | 15 marks        |
|                        | Article Review / Skill enhancement related activities | 10 marks        |
|                        | <b>Total</b>  | <b>40 Marks</b> |
| <b>Practical Marks</b> | Attendance  | 05 marks        |
|                        | Practical Exam  | 20 marks        |
|                        | Viva  | 10 marks        |
|                        | Journal   | 10 marks        |
|                        | Discipline  | 05 marks        |
|                        | <b>Total</b>  | <b>50 Marks</b> |

**Mapping of PSOs & COs**

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO2 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO3 | 2    | 2    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 0    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |

**Mapping of POs & COs**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

|                               |  |                       |
|-------------------------------|--|-----------------------|
| <b>COURSE CODE</b><br>BCCA404 | <b>COURSE NAME</b><br>Cyber Law & Ethics | <b>SEMESTER</b><br>IV |
|-------------------------------|--|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 30              | 0         | 0        | 2            |

|  |                           |
|--|---------------------------|
| <b>Course Prerequisites</b>                        |                           |
| <b>Course Category</b>                             |                           |
| <b>Course focus</b>                                |                           |
| <b>Rationale</b>                                   |                           |
| <b>Course Revision/ Approval Date:</b>             |                           |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to: |

| Course Content (Theory)   | Weightage | Contact hours |
|---|-----------|---------------|
| <b>Unit 1: Introduction to Cyber Law:</b><br>Introduction Computers and its Impact in Society, Overview of Computer and Web Technology, Cyber World, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, <i>Global Cyber Law Frameworks (GDPR, Budapest Convention, etc.)</i> , <i>Recent Case Studies in Cyber Law Enforcement</i>  | 20%       | 6             |
| <b>Unit 2: Cyber Crimes &amp; Cybersecurity Threats:</b><br>Distinction between Cyber Crime and Conventional Crime Cyber Criminals and their Objectives, Kinds of Cyber Crime- Hacking, Digital Forgery, Cyber Stalking/Harassment; cyber pornography; Identity Theft, forgery and fraud; Cyber Defamation, <i>AI-driven Cyber Crimes (Deepfakes, Chatbots, Phishing)</i> , <i>Social Media Crimes (Doxing, Fake Profiles, Online Harassment)</i> , <i>Dark Web Crimes &amp; Ransomware Attacks</i> | 20%       | 6             |
| <b>Unit 3: Cyber Law &amp; Regulatory Frameworks:</b><br>Overview of General Laws and Procedures in India, Introduction to Indian Cyber Law, Digital Signatures & Their Legal Implications, Electronic Contracts & Their Validity, <i>Data Protection &amp; Privacy Laws (DPDP Act, 2023)</i> , <i>Cross-Border Legal Challenges in Cyber Law</i> , <i>Regulatory Authorities: CERT-In, IT Ministry, RBI</i>  | 20%       | 6             |

|   |     |   |
|---|-----|---|
| <i>Guidelines on Cybersecurity</i>  |     |   |
| <b>Unit 4: Intellectual Property Rights (IPR) &amp; Cyber Law:</b><br>Overview of Intellectual Property related Legislation<br>Computer Software and related IPR Issues Copyright law & Cyberspace, Trade mark law & Cyberspace, Law relating to Semiconductor Layout & Design, Penalties & Offences under the IT Act 2000, Offences under BHARTIYA NYAYA SANHITA, 2023 (BNS), Investigation and adjudication of cybercrimes, Digital Evidence & Cyber Forensics, <i>Artificial Intelligence &amp; Copyright Issues, NFTs, Blockchain &amp; Digital Ownership Laws</i>  | 20% | 6 |
| <b>Unit 5: Ethics in Cyber Law &amp; Professionalism:</b> Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers(India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, <i>Cyber Ethics in Gaming, Streaming &amp; social media, AI Ethics (Bias in Algorithms, Automated Decision-Making), Ethical Hacking &amp; White Hat Hacking, Cyber Whistleblowing &amp; Ethical Dilemmas in Cybersecurity</i> | 20% | 6 |

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>   | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|---|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:                          |                                |                                    |
| <b>CO1:</b> To provide an exposure to various types of crimes in cyberworld                         |                                |                                    |
| <b>CO2:</b> Demonstrate a critical understanding of the Cyber law with respect to Indian IT/Act2008 |                                |                                    |
| <b>CO3:</b> To develop good ideas of the legal and practical aspects of their profession            |                                |                                    |
| <b>CO4:</b> Develop awareness of intellectual property rights in cyberspace                         |                                |                                    |
| <b>CO5:</b> Understand ethical considerations in digital and professional environments              |                                |                                    |

| Learning Resources |  |
|--------------------|--|
| 1.                 | <p><b>Text books:</b><br/>           Cyberlaw–The Indianperspective,PavanDuggal</p> <p><b>Reference Books:</b><br/>           1. Chris Reed &amp; John Angel, Computer Law, OUP, NewYork.<br/>           2. Justice Yatindra Singh, CyberLaws, Universal Law Publishing Co, New Delhi.<br/>           3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute.<br/>           4. Jonthan Rosenoer, Cyber Law, Springer, New York.<br/>           5. Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York.<br/>           6. S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd.</p> |
| 2.                 | <b>Journals &amp; Periodicals:</b>   |
| 3.                 | <b>Other Electronic Resources:</b>   |

| Evaluation Scheme                                    | Total Marks   |                 |          |      |          |                      |          |   |          |              |                 |
|--|---|-----------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks  |                 |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks  |                 |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tbody> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </tbody> </table> | Attendance      | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance  | 05 marks        |          |      |          |                      |          |   |          |              |                 |
|  | MCQs  | 10 marks        |          |      |          |                      |          |   |          |              |                 |
|  | Open Book Assignment  | 15 marks        |          |      |          |                      |          |   |          |              |                 |
|  | Article Review / Skill enhancement related activities   | 10 marks        |          |      |          |                      |          |   |          |              |                 |
|  | <b>Total</b>  | <b>40 Marks</b> |          |      |          |                      |          |   |          |              |                 |
|  |   |                 |          |      |          |                      |          |   |          |              |                 |
|  |   |                 |          |      |          |                      |          |   |          |              |                 |
|  |   |                 |          |      |          |                      |          |   |          |              |                 |
|  |   |                 |          |      |          |                      |          |   |          |              |                 |
|  |   |                 |          |      |          |                      |          |   |          |              |                 |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 |      |      |      |      |      |      |
| CO2 |      |      |      |      |      |      |
| CO3 |      |      |      |      |      |      |
| CO4 |      |      |      |      |      |      |
| CO5 |      |      |      |      |      |      |



### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 |     |     |     |     |     |     |
| CO2 |     |     |     |     |     |     |
| CO3 |     |     |     |     |     |     |
| CO4 |     |     |     |     |     |     |
| CO5 |     |     |     |     |     |     |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

|                               |                                    |                       |
|-------------------------------|------------------------------------|-----------------------|
| <b>COURSE CODE</b><br>BCCA405 | <b>COURSE NAME</b><br>GRAPH THEORY | <b>SEMESTER</b><br>IV |
|-------------------------------|------------------------------------|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 15       | 45          | 2               | 0         | 1        | 3            |

|  |   |
|--|---|
| <b>Course Prerequisites</b>                        | Student should have cleared 12th Science  |
| <b>Course Category</b>                             | Minor   |
| <b>Course focus</b>                                | Skills Development  |
| <b>Rationale</b>                                   | The present course impart the knowledge of different types of Graph and its properties. Also students will understand the importance of having graphical interpretation of problem statement to solve it using properties of graphs.  |
| <b>Course Revision/ Approval Date:</b>             |   |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | To enable the student to:<br>1: <b>Understand and develop</b> the fundamental concepts of Graph Theory<br>2: <b>Understand and apply</b> knowledge to analyze models of Graph Theory<br>3: <b>Apply</b> the standard algorithms and solve problems of Graph Theory<br>4. <b>Understand</b> the applications of Graphs theory concepts.<br>5. <b>Understand and analyse</b> the applications of graph theory |

| Course Content (Theory)  | Weight age | Contact hours |
|--|------------|---------------|
| <b>Unit 1:</b><br>Elementary properties of graphs, Applications of graphs, Isomorphism of graphs, Sub-graphs, Walks, Paths and circuits  | 20%        | 6             |
| <b>Unit 2:</b><br>Konigsberg bridge problem, Connected graphs, disconnected graphs and components, Euler graphs, Hamiltonian circuits  | 20%        | 6             |
| <b>Unit 3:</b><br>Definition and properties of tree, Centers in a tree, Rooted and Binary tree, Spanning trees, Minimal Spanning Tree, Matrix Representation of Graphs, Traveling Salesman Problem | 20%        | 6             |
| <b>Unit 4:</b><br>Fundamental circuits, cut set and its properties, Planar graphs and  | 20%        | 6             |

|   |            |          |
|---|------------|----------|
| Kuratowski's two graphs, Representation of planar graphs  |            |          |
| <b>Unit 5:</b><br>Geometric dual, combinatorial dual,<br>Vertex colouring: Chromatic number-Brook's Theorem | <b>20%</b> | <b>6</b> |

| List of Tutorial  | Weight age | Contact hours |
|---|------------|---------------|
| <b>Unit 1:</b> Examples based on Isomorphism of graphs, Sub-graphs, Walks, Paths and circuits | <b>20%</b> | <b>2</b>      |
| <b>Unit 2:</b> Examples based on types of graphs and circuits                                 | <b>20%</b> | <b>2</b>      |
| <b>Unit 3:</b> Examples based on Spanning trees, Binary trees                                 | <b>20%</b> | <b>2</b>      |
| <b>Unit 4:</b> Examples based on Planner and non-planner graphs                               | <b>18%</b> | <b>4</b>      |
| <b>Unit 5:</b> Examples based Colouring of graphs   | <b>22%</b> | <b>5</b>      |

**Instructional Method and Pedagogy:** Classroom Lecture, Case Studies, Quizzes, Presentations, Assignments, discussions

| Course Outcomes:  | Blooms' Taxonomy Domain       | Blooms' Taxonomy Sub Domain              |
|---|-------------------------------|--|
| After successful completion of the above course, students will be able to:              |                               |  |
| CO1: <b>Understand and remember</b> the fundamentals of Graph theory                    | Understand, Analyse, Remember | Define, Classify & Demonstrate           |
| CO2: <b>Understand and analyze</b> the different types of graphs and its properties.    | Analyse, Understand           | Classify, Describe & Demonstrate         |
| CO3: <b>Understand and remember</b> the fundamentals of structures of Graphs.           | Understand, remember          | Define, Describe & Demonstrate           |
| CO4: <b>Understand and apply</b> the concepts of Graph theory to solve the problems.    | Understand, Analyse           | Define Describe                          |
| CO5: <b>Apply</b> the concepts of colouring to understand the problems of graph theory. | Understand, Apply             | Define, Classify, Describe & Demonstrate |

| <b>Learning Resources</b> |  |
|---------------------------|--|
| 1.                        | <p><b>Text books:</b></p> <p>1. J. P. Trembley and R. Manohar, Discrete Mathematical Structure with applications to Computer Science, McGraw Hill Book Company, 2001.</p> <p>2. NarsinghDeo, Graph theory with applications to Engineering and Computer Science, Prentice-Hall of India, 1993.</p> <p><b>Reference Books:</b></p> <p>1. Graph Theory with Applications by J.A.Bondy and U.S.R.Murty, The Macmillan Press Ltd, (1976)</p> <p>2. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 2nd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint 2003</p> |
| 2.                        | <b>Journals &amp; Periodicals:</b>   |
| 3.                        | <b>Other Electronic Resources:</b>   |

| <b>Evaluation Scheme</b>                             | <b>Total Marks</b>                                    |                 |
|--|---|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks  |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks  |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | Attendance  | 05 marks        |
|  | MCQs  | 10 marks        |
|  | Open Book Assignment                                  | 15 marks        |
|  | Article Review / Skill enhancement related activities | 10 marks        |
|  | <b>Total</b>  | <b>40 Marks</b> |

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 1    |
| CO2 | 1    | 1    | 0    | 2    | 0    | 0    |
| CO3 | 2    | 1    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 1    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 1    |



### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None

|                               |   |                       |
|-------------------------------|---|-----------------------|
| <b>COURSE CODE</b><br>AECC401 | <b>COURSE NAME</b><br>Environmental Science | <b>SEMESTER</b><br>IV |
|-------------------------------|---|-----------------------|

| Teaching Scheme (Hours) |           |          |             | Teaching Credit |           |          |              |
|-------------------------|-----------|----------|-------------|-----------------|-----------|----------|--------------|
| Lecture                 | Practical | Tutorial | Total Hours | Lecture         | Practical | Tutorial | Total Credit |
| 30                      | 0         | 0        | 30          | 2               | 0         | 0        | 2            |

|  |  |
|--|--|
| <b>Course Prerequisites</b>                        | Basic knowledge of Environment   |
| <b>Course Category</b>                             | Ability Enhancement  |
| <b>Course focus</b>                                | Awareness  |
| <b>Rationale</b>                                   |  |
| <b>Course Revision/ Approval Date:</b>             |  |
| <b>Course Objectives (As per Blooms' Taxonomy)</b> | <p>To enable the student to:</p> <ol style="list-style-type: none"> <li>1 To <b>understand</b> sensitivity to the total environment and its allied problems.</li> <li>2 To <b>understand</b> environmental issues.</li> <li>3 <b>Develop</b> skills and a commitment to act independently and collectively to environment sustainability.</li> <li>4. <b>Apply</b> the fundamentals of environmental science with use of appropriate scientific information.</li> <li>5 To think critically, ethically, and creatively when <b>evaluating</b> environmental issues.</li> </ol> |

| Course Content (Theory)  | Weightage | Contact hours |
|--|-----------|---------------|
| <b>Unit 1: Introduction of Ecology</b><br>Ecology-Objectives and Classification Concepts of an ecosystem-structure & function of ecosystem components of ecosystem, Hydrological cycle, carbon cycle, oxygen cycle, Nitrogen cycle, Sulphur cycle  | 20%       | 6             |
| <b>Unit 2: Ecological pyramids of various ecosystems</b><br>Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic ecosystem, Estuarine Ecosystem.   | 27%       | 6             |
| <b>Unit 3: Air pollution and its control</b><br>Introduction, Classification of air pollutants, air pollutants and their effects, acid rain, photochemical smog, particulates. Characteristics and biochemical effects of some important air pollutants, Effect of air pollutants on man and environment, Air quality standard, air monitoring | 20%       | 6             |



|   |            |          |
|---|------------|----------|
| and control of air pollution.   |            |          |
| <b>Unit 4: Water pollution and its control</b><br>Introduction, Classification of water pollutants, physical, chemical and biological characteristics of waste water, waste water treatment: Primary treatment- Sedimentation, coagulation, equalization, neutralization, secondary treatment-aerobic treatment-aerated lagoons, trickling filter, activated sludge process, oxidation ditch process, oxidation pond, anaerobic treatment-anaerobic sludge digestion, sludge treatment and disposal and tertiary treatment-evaporation, ion exchange, adsorption, chemical precipitation, Electrodialysis, reverse osmosis. | <b>20%</b> | <b>6</b> |
| <b>Unit 5: Solid and hazardous waste:</b><br>pollution, treatment and disposal Introduction, Classification and origin, characteristics of solid wastes, objectives and considerations in solid waste management, methods of solid waste treatment and disposal - composting, land filling, thermal processes-incineration, pyrolysis, recycling and reuse of solid waste-co-disposal, bioconversion.   | <b>13%</b> | <b>6</b> |

**Instructional Method and Pedagogy:** Classroom Lecture, Quizzes, Presentations, Assignments, discussions

| <b>Course Outcomes:</b>  | <b>Blooms' Taxonomy Domain</b> | <b>Blooms' Taxonomy Sub Domain</b> |
|--|--------------------------------|------------------------------------|
| After successful completion of the above course, students will be able to:   |                                |                                    |
| <b>CO1: Identifying</b> environmental problems:<br><b>Evaluate</b> information from popular electronic and print media                             | Understand,<br>Remember        | Define,<br>Classify                |
| <b>CO2: Understand and Apply</b> necessary scientific concepts and data, consider likely social dynamics, and establish integral cultural contexts | Understand                     | Define,<br>Classify,<br>Describe   |
| <b>CO3:</b> communicate with precision, effective art, and sound rhetoric in writing, in speech, and in digital media.                             | Understand,<br>remember        | Define,<br>Describe                |
| <b>CO4: Evaluate and Apply</b> data, concepts, histories, and narratives necessary for adequate consideration of the issue.                        | Apply                          | Find,<br>Evaluate                  |
| <b>CO5: Understand</b> environmental questions from multiple perspectives, prepared to alter their understanding                                   | Understand,                    | Define,<br>Classify,<br>Describe   |

| <b>Learning Resources</b> |   |
|---------------------------|---|
| 1.                        | <p><b>Text books:</b></p> <ol style="list-style-type: none"> <li>1. Fundamental concepts in Environmental studies by DD Mishra, S. Chand Publishing, India</li> <li>2. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by PS Verma and VK Agarwal, S. Chand Publication, India</li> <li>3. Fundamentals of Ecology by PD Sharma, Rastogi Publications</li> <li>4. Ecology and Environment by PD Sharma, Rastogi Publications</li> <li>5. Environmental Chemistry by BK Sharma, GOEL Publishing house</li> <li>6. Textbook of Environmental Studies, by E. Bharucha, UGC universities Press</li> <li>7. Environmental Studies by R. Rajagopalan, Oxford University Press</li> <li>8. Environmental Pollution and Control by JF Peirce, RF Weiner, and PA Vesilind, Elsevier Science &amp; Technology Book</li> <li>9. Ecology by Mohan P. Arora, Hmalaya Publishing House</li> <li>10. Fundamentals of Ecology by M.C. Dash</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of Ecology by EP Odum Cengage</li> <li>2. Big Questions in Ecology &amp; Evolution by TN Sherratt &amp; DM Wilkinson, Oxford.</li> <li>3. Ecology: Experimental Analysis of Distribution &amp; Abundance by CJ Krebs, Pearson Education, London</li> <li>4. Concept of Ecology by EJ Kormondy, Pearson Education, London</li> <li>5. Conservation Biology: Voices from the Tropics. By Sodhi, N.S., Gibson, L. &amp; Raven, P.H. (eds) John Wiley &amp; Sons</li> <li>6. Plastic and Environment by RE Hester and RM Harrison, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK</li> <li>7. Environmental Education and Ecotourism by Fernando Ramirez and Josefina Santana, Springer Nature Switzerland AG</li> <li>8. Reclamation of Arid lands by Mohammad Jafari, Ali Tavili, Fatemeh Panahi, Ehsan Zandi Esfahan and Majid Ghorbani, Springer International Publishing Switzerland</li> <li>9. Emerging Issues in Ecology and Environmental Science, Case studies from India by T. Jindal, Springer Nature Switzerland</li> <li>10. Environmental Water Footprints Concepts and Case Studies from the Food Sector by SS Muthu, Springer Nature Singapore</li> </ol> |
| 2.                        | <p><b>Journals:</b></p> <ol style="list-style-type: none"> <li>1. Environmental Pollutants and Bioavailability</li> <li>2. Clean Air Journal</li> <li>3. Emerging Contaminants</li> <li>4. Environment: Science and Policy for Sustainable Development</li> <li>5. Annual Review of Environment and Resources</li> <li>6. Renewable Energy</li> </ol>   |

|    |   |
|----|---|
|    | <p>7. Renewable &amp; Sustainable Energy Reviews<br/>8. Environmental Health<br/>9. Environment International<br/>10. International Journal of Environmental Research and Public Health</p> <p><b>Periodicals</b></p> <p>1. The Environmental Magazine<br/>2. Natural History (magazine)<br/>3. Environment News Service<br/>4. The Environmentalist<br/>5. Green Builder Media</p>   |
| 3. | <p><b>Other Electronic Resources:</b></p> <p>1. Green.tv—supported by UNEP—broadband TV channel for films about environmental issues<br/>2. Climate Change TV—funded by companies, governments and organisations, and produced by the magazine Responding to Climate Change—the world's first web channel specific to climate change videos<br/>3. Terra: The Nature of Our World video podcast produced in conjunction with the Master of Fine Arts program in Science &amp; Natural History Filmmaking at Montana State University, Filmmakers for Conservation, and PBS—weekly video show about science and natural history<br/>4. Green Times Ahead—based in India—student run non-profit with a focus on evading the detrimental effects of air and water pollution, constantly involved in communal engagement<br/>5. IUCN Red data List<br/>6. Air quality index<br/>7. Nature Education Knowledge Project</p> |

| Evaluation Scheme                                    | Total Marks  |            |          |      |          |                      |          |   |          |              |                 |
|--|--|------------|----------|------|----------|----------------------|----------|---|----------|--------------|-----------------|
| <b>Theory: Mid semester Marks</b>                    | 20 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: End Semester Marks</b>                    | 40 marks   |            |          |      |          |                      |          |   |          |              |                 |
| <b>Theory: Continuous Evaluation Component Marks</b> | <table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review / Skill enhancement related activities</td> <td>10 marks</td> </tr> <tr> <td><b>Total</b></td> <td><b>40 Marks</b></td> </tr> </table> | Attendance | 05 marks | MCQs | 10 marks | Open Book Assignment | 15 marks | Article Review / Skill enhancement related activities | 10 marks | <b>Total</b> | <b>40 Marks</b> |
|  | Attendance   | 05 marks   |          |      |          |                      |          |   |          |              |                 |
|  | MCQs   | 10 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Open Book Assignment   | 15 marks   |          |      |          |                      |          |   |          |              |                 |
|  | Article Review / Skill enhancement related activities  | 10 marks   |          |      |          |                      |          |   |          |              |                 |
| <b>Total</b>   | <b>40 Marks</b>  |            |          |      |          |                      |          |   |          |              |                 |



|  |  |
|--|--|
|  |  |
|--|--|

### Mapping of PSOs & COs

|     | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|------|------|------|------|------|------|
| CO1 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO2 | 1    | 2    | 0    | 1    | 0    | 0    |
| CO3 | 2    | 2    | 1    | 1    | 0    | 0    |
| CO4 | 1    | 1    | 2    | 0    | 0    | 0    |
| CO5 | 0    | 1    | 1    | 0    | 0    | 0    |

### Mapping of POs & COs

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 2   | 1   | 1   | 0   | 1   | 0   |
| CO2 | 1   | 2   | 2   | 0   | 1   | 0   |
| CO3 | 1   | 1   | 1   | 1   | 1   | 0   |
| CO4 | 1   | 2   | 1   | 0   | 0   | 0   |
| CO5 | 0   | 0   | 1   | 0   | 0   | 0   |

1: Slight (low); 2: Moderate (Medium); 3: Substantial (High); 0 None