

# SCHEME OF EXAMINATION

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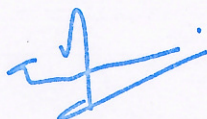
## SYLLABI

for

### **Bachelor of Computer Applications (BCA)** Scheme and Syllabus (w.e.f. AS 2021-22)

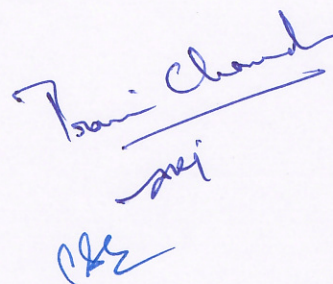
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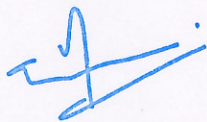


GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY

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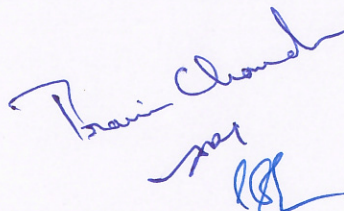


### **Vision of the School**

Create high-quality engineering professionals

### **Mission of the School**

To serve humanity by creating professionally competent, socially sensitive engineers with high ethical values who can work as individuals or in groups in multicultural global environments.





## I. BACHELOR OF COMPUTER APPLICATIONS PROGRAMME DETAILS

### 1. Aim

The programme covers rudimentary to advanced concepts in Computer Science and its applications in various domains. An exceptionally broad range of topics covering current trends and technologies in the field of information technology and computer science are included in the syllabus. The hands on sessions in Computer labs using various Programming languages and tools are also given to have a deep conceptual understanding of the topics to widen the horizon of students' self- experience. Students, who choose BCA Programme, develop the ability to think critically, logically, analytically and to use and apply current technical concepts and practices in the core development of solutions in the multiple domains. The knowledge and skills gained with a degree in Computer Application prepare graduates for a wide range of jobs in education, research, government sector, business sector and industry. In broader perspective the mission of teaching BCA is to produce employable IT workforce, that will have sound knowledge of IT and business fundamentals that can be applied to develop and customize solutions for various Enterprises.

### 2. Programme Objectives

It is envisioned that the graduates passing out BCA degree, will achieve the following objectives and will be able to

| Programme Objectives (POs) | Description                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PO1                        | Understand the fundamental concepts of Computers, Software hardware and peripheral devices and evolution of computer technologies.                                                                        |
| PO2                        | Familiarized with Business environment and Information Technology and its Applications in different domains.                                                                                              |
| PO3                        | Gain knowledge to identify, explain and apply functional programming and object-oriented programming techniques and use of databases to develop computer programs.                                        |
| PO4                        | Analyze, design, implement and evaluate computerized solutions to real life problems, using appropriate computing methods including web applications.                                                     |
| PO5                        | Understand the front end and backend of software applications.                                                                                                                                            |
| PO6                        | Gain expertise in at least one emerging technology.                                                                                                                                                       |
| PO7                        | Acquire knowledge about computer networks, network devices and their configuration protocols, security concepts at various level etc.                                                                     |
| PO8                        | Apply techniques of software validation and reliability analysis to the development of computer programs.                                                                                                 |
| PO9                        | Acquire Technical, Communication and management Skills to convey or present information, applications, instructions, policies, procedures, decisions, documentations etc. verbally as well as in writing. |
| PO10                       | Recognize the various issues related to society, environment, health and vivid cultures and understand the responsibilities to contribute in providing the solutions.                                     |
| PO11                       | Acquire technical skills to lead a productive life in the society as a professional or as an entrepreneur.                                                                                                |

### 3. Programme Learning Outcomes

The completion of the BCA Programme shall enable a student to:

- To design, implement, and evaluate computer-based system, process, component, or program to meet desired needs by critical understanding, analysis and synthesis
- Identify applications of Computer Science in other fields in the real world to enhance the career prospects
- Realize the requirement of lifelong learning through continued education and research.
- Use the concepts of best practices and standards to develop user interactive and abstract application
- Understand the professional, ethical, legal, security, social issues and responsibilities.



The detailed list of programme learning outcomes is as follows:

| PLO  | Attribute                                                | Description                                                                                                                                                                                                |
|------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PLO1 | Communication Skills                                     | The student should be able to communicate the technical information both orally and in writing professionally.                                                                                             |
| PLO2 | Use of Software Tools                                    | Create, select, adapt and apply suitable tools and technologies to a wide range of computational activities.                                                                                               |
| PLO3 | Technical Skills                                         | Acquire necessary knowledge of technical, scientific as well as basic managerial and financial procedures to analyze and solve real world problems within their work domain                                |
| PLO4 | Domain Awareness                                         | Clarity on both conceptual and application oriented skills in commerce, Finance & Accounting and its Applications in Business context.                                                                     |
| PLO5 | Technical Support                                        | Must be able to provide technical support for various software applications.                                                                                                                               |
| PLO6 | Analysis and investigation of Complex Computing Problems | Ability to analyze research and investigate complex computing problems through design of experiments, analysis and interpretation of data and synthesis of the information to arrive at valid conclusions. |
| PLO7 | Design / Development of Solutions                        | Apply the knowledge gained in core courses to a broad range of advanced topics in computer science, to learn and develop sophisticated technical products independently.                                   |
| PLO8 | Imbibe Cyber Ethics                                      | Awareness on ethics, values, sustainability and creativity aspects of technical solutions.                                                                                                                 |

## II. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses.

### 1. Types of courses in Choice Based Credit System (CBCS)

**1.1 Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

**1.2 Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

a) **Discipline Specific Elective (DSE) Course:** Elective courses offered by the main discipline/subject of study are referred to as Discipline Specific Electives.

b) **Project work/Dissertation** is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A candidate studies such a course on his own with an advisory support by a teacher/faculty member. The work done will have to be submitted in writing as a dissertation.

c) **Generic Elective (GE) Course:** Elective courses that are generic or interdisciplinary by nature chosen from an unrelated discipline/ subject with an intention to seek exposure beyond discipline/s of choice are called Generic Electives. Students will have to choose one elective each in the third and fourth semester from the lists GE1 to GE2 given in this syllabus.

**1.3 Ability Enhancement Courses (AEC):** The Ability Enhancement (AE) Courses are the course that lead to Knowledge enhancement. These are of two types.

a) **AE Compulsory Course (AECC):** Environmental Studies, English Communication/MIL Communication.

b) **AE Elective Course (AEEC):** AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc. These courses / papers are to be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.



### III. PROGRAMME STRUCTURE

The BCA programme is a three-year course of 160 credits divided into six-semesters. A student is required to complete 150 credits for the completion of course and the award of degree.

|                     | Academic Year | Odd Semester | Credits | Even Semester | Credits |
|---------------------|---------------|--------------|---------|---------------|---------|
| Part – I            | First Year    | Semester I   | 26      | Semester II   | 26      |
| Part – II           | Second Year   | Semester III | 27      | Semester IV   | 27      |
| Part – III          | Third Year    | Semester V   | 27      | Semester VI   | 29      |
| Total Credits – 162 |               |              | 80      |               | 82      |

**Eligibility Criteria:** The eligibility criteria for BCA programme for an academic session will be provided in the admission brochure (as for Academic Session (AS) 2021-22. The eligibility criteria of BCA programme for academic session 2022-23 onwards shall be as follows:

“Pass in 12th Class of 10+2 of CBSE or equivalent with a minimum of 50% marks in aggregate\* with pass in English (core or elective or functional). Mathematics or (Computer Science / Informatics Practice / Computer Applications / Multimedia & Web Technology / Data Management Application / Web Application as compulsory subject of non-vocational stream with 50 theory and 50 practical ratio) or equivalent.”

OR  
“Three year Diploma in a branch of Engineering from a polytechnic duly approved by All India Council for Technical Education and affiliated to a recognized examining body with a minimum of 50% marks in aggregate.”

**Admission Criteria:** Admission shall be based on the merit of the written test /Common Entrance Test Conducted by the University.

### IV. INSTRUCTIONS FOR PAPER SETTERS

- Question Paper setter for each course must refer the instructions provided with the detailed syllabus of the specific courses.
- The question paper shall be preferably set from the prescribed text books and reference books, mentioned in the syllabus and should be at the level of the prescribed textbook(s).



V. CREDIT ALLOCATION (BCA PROGRAMME OF STUDY)

| Course                                                                                                                                         | Credits                                |                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------|
|                                                                                                                                                | Theory + Practical                     | Theory + Tutorial                     |
|                                                                                                                                                | Core Course (6 credits)<br>(12 papers) | Core Course (4 credits)<br>(7 papers) |
| Core Course Theory<br>19 Papers                                                                                                                | 12x4=48                                | 7x3=21                                |
| Core Course Practical / Tutorial* 19<br>Papers                                                                                                 | 12x2=24                                | 7x1=7                                 |
| <b>Elective Course</b><br>(4 Papers of 5 credits each, 5 Papers of 4 credits each and 7 Papers of 2 credits each)                              |                                        |                                       |
| A.1. Discipline Specific Elective (4<br>Papers)                                                                                                | 4x4 = 16                               |                                       |
| A.2. Discipline Specific Elective<br>Practical/Tutorial*<br>(4 Papers)                                                                         | 1x4 = 04                               |                                       |
| B.1. Generic Elective/<br>Interdisciplinary<br>(2 Papers)                                                                                      |                                        | 2x3 = 06                              |
| B.2. Generic Elective Practical/<br>Tutorial*<br>(2 Papers)                                                                                    |                                        | 2x1 = 02                              |
| 1.Ability Enhancement Compulsory<br>Courses(AECC)<br>(3 Papers of 4 credit each and 1 Paper<br>of 6 Credit including Minor & Major<br>Project) | 1x4 + 1x6= 10                          | 2x4=8                                 |
| 2. Ability Enhancement Compulsory<br>Courses(AECC)<br>(2 Papers of 2 credit)                                                                   |                                        | 2x2 = 04                              |
| Skill Enhancement Courses (SEC) (5<br>Papers of 2 credit each)                                                                                 | 5x2 = 10                               |                                       |
| Co-Curricular Activities                                                                                                                       | 2                                      |                                       |
| <b>Total credit 162</b>                                                                                                                        | <b>114</b>                             | <b>48</b>                             |

\*Wherever there is practical, there will be no tutorial and vice-versa.



**V. CBCS COURSE STRUCTURE FOR BCA PROGRAMME**

**1. Semester wise placement of the courses**

| Semester                            | CORE COURSE (18)                                    | Ability Enhancement Compulsory Course (AECC) (3)                       | Skill Enhancement Course (SEC) (2)            | Elective: Discipline Specific (DSE) (5) | Elective: Generic (GE) (2)        |
|-------------------------------------|-----------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------|-----------------------------------|
| <b>I<br/>Total<br/>Credits 26</b>   | CC1 (4)<br>Discrete Mathematics                     | AECC 1 (4)<br>Technical Communication                                  |                                               |                                         |                                   |
|                                     | CC2 (4+2)<br>Programming using 'C' Language         |                                                                        |                                               |                                         |                                   |
|                                     | CC3(4+2) Fundamentals of IT & Computers             |                                                                        |                                               |                                         |                                   |
|                                     | CC4 (4+2)<br>Web Technologies                       |                                                                        |                                               |                                         |                                   |
| <b>II<br/>Total<br/>Credits 26</b>  | CC5 (4)<br>Applied Mathematics                      | AECC2 (2)<br>Environment Studies                                       | SEC -1 (2)                                    |                                         |                                   |
|                                     | CC6 (4+2)<br>Web Based Programming                  |                                                                        |                                               |                                         |                                   |
|                                     | CC7 (4+2)<br>Data Structure And Algorithm Using 'C' |                                                                        |                                               |                                         |                                   |
|                                     | CC8 108 (4+2)<br>Database Management System         |                                                                        |                                               |                                         |                                   |
|                                     |                                                     |                                                                        |                                               |                                         |                                   |
| <b>III<br/>Total<br/>Credits 27</b> | CC9 (4)<br>Computer Network                         | AECC3 (2)<br>Human Values and ethics                                   | SEC -2 (2)                                    | DSE- 1<br>(4+1)                         | Any course from the list GE-1(4)  |
|                                     | CC10 (4)<br>Computer Organization and Architecture  |                                                                        |                                               |                                         |                                   |
|                                     | CC11 (4+2)<br>Object Oriented Programming with C++  |                                                                        |                                               |                                         |                                   |
| <b>IV<br/>Total<br/>Credits 27</b>  | CC12(4+2)<br>Java Programming                       | AECC4 (4)<br>Introduction to Management & Entrepreneurship Development | SEC-3 (2)<br>Personality Development Skills   | DSE -2<br>(4+1)                         | Any course from the list GE-2 (4) |
|                                     | CC13 (4+2)<br>Software Engineering                  |                                                                        |                                               |                                         |                                   |
| <b>V<br/>Total<br/>Credits 27</b>   | CC14 (4+2) Operating System & Linux Programming     | AECC 5<br>Minor Project (4)                                            | SEC-4 (2)<br>Summer Internship                | DSE -3<br>(4+1)                         |                                   |
|                                     | CC15(4+2) Computer Graphics                         |                                                                        |                                               |                                         |                                   |
|                                     | CC 16 (4) Cloud computing                           |                                                                        |                                               |                                         |                                   |
| <b>VI<br/>Total<br/>Credits 27</b>  | CC17 (4) Datawarehousing and Data Mining            | AECC 6<br>Major Project (6)                                            | SEC-5 (2)<br>Seminar/ Conference Presentation | DSE -4<br>(4+1)                         |                                   |
|                                     | CC18 (4)<br>E-Commerce                              |                                                                        |                                               |                                         |                                   |
|                                     | CC19 (4+2) Internet of Things                       |                                                                        |                                               |                                         |                                   |

**1.1 Skill Enhancement Course 1 (SEC - 1)**

SEC 1 (choose one) Skill development course from the following

- MOOC course from SWAYAM / NPTEL of minimum 2 credits. Certificate is Mandatory for the degree
- Front End Design Tool VB.Net Lab
- Statistical Analysis using Excel
- Designing Lab Photoshop

**SEC 2 (choose one)**



- (i) MOOC course From Swayam / NPTEL of minimum 2 credits. Certificate is Mandatory for the degree)
- (ii) Designing Lab CorelDraw
- (iii) ASP.Net
- (iv) AR/VR

### **1.2 Discipline Specific Electives (DSE) (Choose any One Group of DSE)**

Every institution shall offer at least to DSE groups to the students subject to conditions enumerated in this document.

#### **DSE-A – Data Science & Analytics**

- 1. Basics of Python Programming
- 2. Introduction to Data Science
- 3. Data Visualization & Analytics
- 4. Machine Learning with Python

#### **DSE-B – Artificial Intelligence & Machine Learning**

- 1. Basics of Python Programming
- 2. Introduction to Artificial Intelligence
- 3. Machine Learning with Python
- 4. Deep Learning with Python

#### **DSE-C– Cyber Security**

- 1. Cyber Security
- 2. Network Security
- 3. Web Security
- 4. IT Acts and Cyber Laws

#### **DSE-D – Software Development**

- 1. Basics of Python Programming
- 2. Web Development with Python
- 3. Web Development with Java & JSP
- 4. Mobile Application Development

### **1.3 Generic Elective (GE) for BCA Students**

#### **GE 1 (choose any One)**

- (i) Principles of Management & Organizational Behaviour
- (ii) Any One Paper Offered as open elective by other School /Department / Programme

#### **GE 2 (choose any One)**

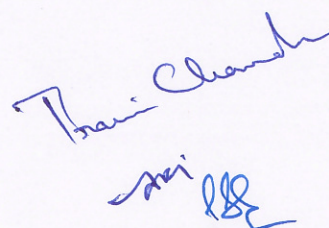
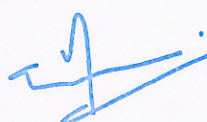
- (i) Digital Marketing
- (ii) Principles of Accounting
- (iii) Any One Paper Offered as open elective by other School / Department / Programme



#### **1.4 Generic (Open) Electives for other undergraduate programmes**

The following Core courses of BCA programme may be offered as Generic Elective for other undergraduate programmes. Maximum number of students from other School / Department / Programme should not exceed 20% of total intake for the programme.

| S.No. | Semester | Subject Code       | Subject Name                                                    |
|-------|----------|--------------------|-----------------------------------------------------------------|
| 1     | I        | BCA 105<br>BCA 173 | Fundamentals of Computers & IT<br>Practical – II IT Lab         |
| 2     | I        | BCA 107<br>BCA 175 | Web Technologies<br>Practical-III Web Tech Lab                  |
| 3     | II       | BCA 108<br>BCA 176 | Database Management System<br>Practical – VI DBMS Lab           |
| 4     | III      | BCA 205<br>BCA 271 | Object Oriented Programming using C++<br>Practical – VI C++ Lab |
| 5     | III      | BCA 211            | Basics of Python Programming                                    |
| 6     | VI       | BCA 304            | E-Commerce                                                      |





### SEMESTER WISE EXAMINATION SCHEME

Based on the above-mentioned course categories the semester wise Evaluation scheme of BCA Programme will be as follows:

#### FIRST SEMESTER EXAMINATION

| Code No.                                                                      | Paper                          | Course Category                                        | L | T/P | Credits   | Marks Internal | Marks External | Max Marks  |
|-------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------|---|-----|-----------|----------------|----------------|------------|
| <b>Core Course Theory</b>                                                     |                                |                                                        |   |     |           |                |                |            |
| BCA 101                                                                       | Discrete Mathematics           | Core Course Theory                                     | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 103                                                                       | Programming Using 'C' Language | Core Course Theory                                     | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 105#                                                                      | Fundamentals of Computers & IT | Core Course Theory                                     | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 107#                                                                      | Web Technologies               | Core Course Theory                                     | 3 | 1   | 4         | 25             | 75             | 100        |
| <b>Ability Enhancement Compulsory Course (AECC)</b>                           |                                |                                                        |   |     |           |                |                |            |
| BCA 109                                                                       | Technical Communication        | AECC                                                   | 3 | 1   | 4         | 25             | 75             | 100        |
| <b>Core Course Practicals</b>                                                 |                                |                                                        |   |     |           |                |                |            |
| BCA 171                                                                       | Practical – I 'C' Prog. Lab    | Core Course Practical                                  | 0 | 4   | 2         | 40             | 60             | 100        |
| BCA 173#                                                                      | Practical – II IT Lab          | Core Course Practical                                  | 0 | 4   | 2         | 40             | 60             | 100        |
| BCA 175#                                                                      | Practical-III Web Tech Lab     | Core Course Practical                                  | 0 | 4   | 2         | 40             | 60             | 100        |
| <b>Bridge Course (Mandatory for Students from Non Mathematics background)</b> |                                |                                                        |   |     |           |                |                |            |
| BCA 181*                                                                      | Bridge Course in Mathematics   | Mandatory for Students from Non Mathematics background | 2 | 0   | 0         | Pass Grade     | -----          | -----      |
| <b>Total Credits</b>                                                          |                                |                                                        |   |     | <b>26</b> |                |                | <b>800</b> |

\* Non Credit subject mandatory for the students who do not have mathematics in 12<sup>th</sup> Std. The student has to obtain at least 40 marks. The examination of this paper shall be conducted by the concerned teacher teaching the course / paper as Teacher's Continuous Evaluation for total 100 marks. Only the pass or fail status is to be specified on the marksheet of examination and the result of the student. Passing in this paper is mandatory for the student.

# Generic Elective (GE) for other undergraduate programmes

**TOTAL MARKS: 800**



## SECOND SEMESTER EXAMINATION

| Code No.                                                 | Paper                                  | Course Category       | L | T/P | Credits   | Marks Internal | Marks External | Max Marks  |
|----------------------------------------------------------|----------------------------------------|-----------------------|---|-----|-----------|----------------|----------------|------------|
| <b>Core Course Theory</b>                                |                                        |                       |   |     |           |                |                |            |
| BCA 102                                                  | Applied Mathematics                    | Core Course Theory    | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 104                                                  | Web based Programming                  | Core Course Theory    | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 106                                                  | Data Structure And Algorithm Using 'C' | Core Course Theory    | 3 | 1   | 4         | 25             | 75             | 100        |
| BCA 108#                                                 | Database Management System             | Core Course Theory    | 3 | 1   | 4         | 25             | 75             | 100        |
| <b>Ability Enhancement Compulsory Course (AECC)</b>      |                                        |                       |   |     |           |                |                |            |
| BCA 110                                                  | Environment Studies                    | AECC                  | 2 | 0   | 2         | 25             | 75             | 100        |
| <b>*Skill Enhancement Course (AEEC) (Choose any One)</b> |                                        |                       |   |     |           |                |                |            |
| BCA 132                                                  | **MOOC course from SWAYAM / NPTEL      | SEC-1                 | 0 | 0   | 2         | 100            | 0              | 100        |
| BCA 134                                                  | Front End Design Tool VB.Net Lab       | SEC-1                 | 0 | 4   | 2         | 100            | 0              | 100        |
| BCA 136                                                  | Statistical Analysis using Excel       | SEC-1                 | 0 | 4   | 2         | 100            | 0              | 100        |
| BCA 138                                                  | Designing Lab Photoshop                | SEC-1                 | 0 | 4   | 2         | 100            | 0              | 100        |
| <b>Core Course Practical</b>                             |                                        |                       |   |     |           |                |                |            |
| BCA 172                                                  | Practical-IV WBP Lab                   | Core Course Practical | 0 | 4   | 2         | 40             | 60             | 100        |
| BCA 174                                                  | Practical – V DS Lab                   | Core Course Practical | 0 | 4   | 2         | 40             | 60             | 100        |
| BCA 176#                                                 | Practical – VI DBMS Lab                | Core Course Practical | 0 | 4   | 2         | 40             | 60             | 100        |
| <b>Total</b>                                             |                                        |                       |   |     | <b>26</b> |                |                | <b>900</b> |

\*NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute)

# Generic Elective (GE) for other undergraduate programmes

**TOTAL MARKS: 900****\*\*Instructions for MOOC course**

- MOOC Course should be done from SWAYAM/NPTEL as per the guidelines of UGC.
- For securing the credits, the student is required to complete the assessment of the course and to provide the certificate of the course done from SWAYAM/NPTEL.
- The fees (if any) for the registration and/or assessment of the MOOC course must be borne by the student only.
- If the student secures more than 2 credits for the MOOC Course even then 2 credits shall be considered for this subject and the grade/marks provided by assessing authority shall be transferred to the university by the institution where the student is studying. The result of the MOOC courses shall be taken on record by the University's Examination Division and a result declared for these papers. The student must submit the result of such papers to their respective institutions. All results for the MOOC's course may be submitted before the completion of other requirements including credit requirements.



### THIRD SEMESTER EXAMINATION

| THIRD SEMESTER EXAMINATION                          |                                                             |                       |   |     |         |                |                |    |           |
|-----------------------------------------------------|-------------------------------------------------------------|-----------------------|---|-----|---------|----------------|----------------|----|-----------|
| Code No.                                            | Paper                                                       | Course Type           | L | T/P | Credits | Marks Internal | Marks External |    | Max Marks |
|                                                     |                                                             |                       |   |     |         |                | Th             | Pr |           |
| Core Course Theory                                  |                                                             |                       |   |     |         |                |                |    |           |
| BCA 201                                             | Computer Network                                            | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 203                                             | Computer Organization and Architecture                      | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 205#                                            | Object Oriented Programming with C++                        | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| Ability Enhancement Compulsory Course (AECC)        |                                                             |                       |   |     |         |                |                |    |           |
| BCA-207                                             | Human Values and Ethics                                     | AECC                  | 2 | 0   | 2       | 25             | 75             | 0  | 100       |
| *Discipline Specific Elective (Choose any One)      |                                                             |                       |   |     |         |                |                |    |           |
| BCA 211#                                            | Basics of Python Programming                                | DSE-1                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 213                                             | Cyber Security                                              | DSE-1                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| **Generic Elective (Choose any One)                 |                                                             |                       |   |     |         |                |                |    |           |
| BCA 221                                             | Principles of Management & Organizational Behaviour         | GE-1                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 223                                             | Open Elective offered by other Department/School /programme | GE-1                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| ***Skill Enhancement Course (AEEC) (Choose any One) |                                                             |                       |   |     |         |                |                |    |           |
| BCA 231                                             | ****MOOC course from SWAYAM / NPTEL                         | SEC-2                 | 0 | 0   | 2       | 100            | 0              | 0  | 100       |
| BCA 233                                             | Designing Lab CorelDraw                                     | SEC-2                 | 0 | 0   | 2       | 100            | 0              | 0  | 100       |
| BCA 235                                             | ASP.Net                                                     | SEC-2                 | 0 | 0   | 2       | 100            | 0              | 0  | 100       |
| BCA 237                                             | AR/VR                                                       | SEC-2                 | 0 | 0   | 2       | 100            | 0              | 0  | 100       |
| Core Course Practical                               |                                                             |                       |   |     |         |                |                |    |           |
| BCA 271#                                            | Practical – VII C++ Lab #                                   | Core Course Practical | 0 | 4   | 2       | 40             | 0              | 60 | 100       |
|                                                     | Total                                                       |                       |   |     | 27      |                |                |    | 800       |

# Generic Elective (GE) for other undergraduate programmes

\* First Subject from Discipline specific chosen group

\*\* Choose one subject from list of GE-1

\*\*\* NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute, that is the assessment shall be conducted by the institution for all 100 marks as Teacher's Continuous Assessment.

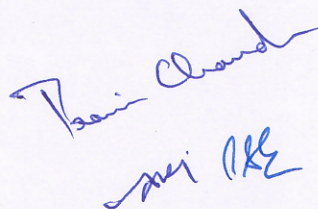
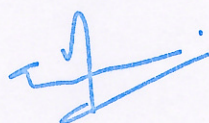
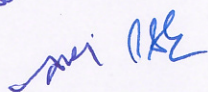
\*\*Instructions for MOOC course

1. MOOC Course should be done from SWAYAM/NPTEL as per the guidelines of UGC.
2. For securing the credits, the student is required to complete the assessment of the course and to provide the certificate of the course done from SWAYAM/NPTEL.



3. The fees (if any) for the registration and/or assessment of the MOOC course must be borne by the student only.
4. If the student secures more than 2 credits for the MOOC Course even then 2 credits shall be considered for this subject and the grade/marks provided by assessing authority shall be transferred to the university by the institution where the student is studying. The result of the MOOC courses shall be taken on record by the University's Examination Division and a result declared for these papers. The student must submit the result of such papers to their respective institutions. All results for the MOOC's course may be submitted before the completion of other requirements including credit requirements.
5. If the student secures more than 2 credits for the MOOC Course even then 2 credits shall be considered for this subject and the grade/marks provided by assessing authority shall be transferred to the university.

**TOTAL MARKS: 800**



#### FOURTH SEMESTER EXAMINATION

| Code No.                                       | Paper                                                        | Course Type           | L | T/P | Credits | Marks Internal | Marks External |    | Max Marks |
|------------------------------------------------|--------------------------------------------------------------|-----------------------|---|-----|---------|----------------|----------------|----|-----------|
|                                                |                                                              |                       |   |     |         |                | Th             | Pr |           |
| Core Course Theory                             |                                                              |                       |   |     |         |                |                |    |           |
| BCA 202                                        | Java Programming                                             | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 204                                        | Software Engineering                                         | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| Ability Enhancement Compulsory Course (AECC)   |                                                              |                       |   |     |         |                |                |    |           |
| BCA 206                                        | Introduction to Management & Entrepreneurship Development    | AECC                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| *Discipline Specific Elective (Choose any One) |                                                              |                       |   |     |         |                |                |    |           |
| BCA 212                                        | Introduction to Data Science                                 | DSE-2                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 214                                        | Introduction to Artificial Intelligence                      | DSE-2                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 216                                        | Network Security                                             | DSE-2                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 218                                        | Web Development with Python                                  | DSE-2                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| **Generic Elective (Choose any One)            |                                                              |                       |   |     |         |                |                |    |           |
| BCA 222                                        | Digital Marketing                                            | GE-2                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 224                                        | Principles of Accounting                                     | GE-2                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 226                                        | Open Elective offered by other Department/ School /programme | GE-2                  | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| ***Skill Enhancement Course (AEEC)             |                                                              |                       |   |     |         |                |                |    |           |
| BCA 232                                        | Personality Development Skills                               | SEC-3                 | 2 | 0   | 2       | 100            | 0              | 0  | 100       |
| Core Course Practical                          |                                                              |                       |   |     |         |                |                |    |           |
| BCA 272                                        | Practical –XII Java Lab                                      | Core Course Practical | 0 | 4   | 2       | 40             | 0              | 60 | 100       |
| BCA 274                                        | Practical – IX SE Lab                                        | Core Course Practical | 0 | 4   | 2       | 40             | 0              | 60 | 100       |
|                                                | Total                                                        |                       |   |     | 27      |                |                |    | 800       |

\* Second Subject from Discipline specific chosen group

\*\* Choose one subject from list of GE-2

\*\*\* NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute), that is the assessment shall be conducted by the institution for all 100 marks as Teacher's Continuous Assessment.

Summer Training will be held for 4 weeks after the end of fourth semester.

Viva-Voce will be conducted in fifth semester.

**TOTAL MARKS: 800**

*Train Chandra*  
*ani (PSE)*



**FIFTH SEMESTER EXAMINATION**

| FIFTH SEMESTER EXAMINATION                     |                                      |                       |   |     |         |                |                |    |           |
|------------------------------------------------|--------------------------------------|-----------------------|---|-----|---------|----------------|----------------|----|-----------|
| Code No.                                       | Paper                                | Course Type           | L | T/P | Credits | Marks Internal | Marks External |    | Max Marks |
|                                                |                                      |                       |   |     |         |                | Th             | Pr |           |
| Core Course Theory                             |                                      |                       |   |     |         |                |                |    |           |
| BCA 301                                        | Operating System & Linux Programming | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 303                                        | Computer Graphics                    | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| BCA 305                                        | Cloud Computing                      | Core Course Theory    | 3 | 1   | 4       | 25             | 75             | 0  | 100       |
| Ability Enhancement Compulsory Course (AECC)   |                                      |                       |   |     |         |                |                |    |           |
| BCA 307                                        | Minor Project                        | AECC                  | 0 | 8   | 4       | 40             | 0              | 60 | 100       |
| *Discipline Specific Elective (Choose any One) |                                      |                       |   |     |         |                |                |    |           |
| BCA 311                                        | Data Visualization & Analytics       | DSE-3                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 313                                        | Machine Learning with Python         | DSE-3                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 315                                        | Web Security                         | DSE-3                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| BCA 317                                        | Web Development with Java & JSP      | DSE-3                 | 4 | 1   | 5       | 25             | 50             | 25 | 100       |
| Skill Enhancement Course (AEEC)                |                                      |                       |   |     |         |                |                |    |           |
| BCA 331                                        | **Summer Training Project            | SEC-4                 | 0 | 0   | 2       | 100            | 0              | 0  | 100       |
| Core Course Practical                          |                                      |                       |   |     |         |                |                |    |           |
| BCA 371                                        | Practical – X Linux - OS Lab         | Core Course Practical | 0 | 4   | 2       | 40             | 0              | 60 | 100       |
| BCA 373                                        | Practical – XI CG Lab                | Core Course Practical | 0 | 4   | 2       | 40             | 0              | 60 | 100       |
|                                                | Total                                |                       |   |     | 27      |                |                |    | 800       |

\* Third Subject from Discipline specific chosen group

\*\* NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute), that is the assessment shall be conducted by the institution for all 100 marks as Teacher's Continuous Assessment.

**TOTAL MARKS: 800**



SIXTH SEMESTER EXAMINATION

| Code No.                                       | Paper                                                             | Course Type           | L    | T/P | Cred its | Marks Internal | Marks External |    | Max Mark s |
|------------------------------------------------|-------------------------------------------------------------------|-----------------------|------|-----|----------|----------------|----------------|----|------------|
|                                                |                                                                   |                       |      |     |          |                | Th             | Pr |            |
| Core Course Theory                             |                                                                   |                       |      |     |          |                |                |    |            |
| BCA 302                                        | Data Ware Housing & Data Mining                                   | Core Course Theory    | 3    | 1   | 4        | 25             | 75             | 0  | 100        |
| BCA 304#                                       | E- Commerce                                                       | Core Course Theory    | 3    | 1   | 4        | 25             | 75             | 0  | 100        |
| BCA 306                                        | Internet of Things                                                | Core Course Theory    | 3    | 1   | 4        | 25             | 75             | 0  | 100        |
| Ability Enhancement Compulsory Course (AECC)   |                                                                   |                       |      |     |          |                |                |    |            |
| BCA 308                                        | ***Major Project                                                  | AECC                  | ---- | 12  | 6        | 40             | 0              | 60 | 100        |
| *Discipline Specific Elective (Choose any One) |                                                                   |                       |      |     |          |                |                |    |            |
| BCA 312                                        | Machine Learning with Python                                      | DSE-4                 | 4    | 1   | 5        | 25             | 50             | 25 | 100        |
| BCA 314                                        | Deep Learning with Python                                         | DSE-4                 | 4    | 1   | 5        | 25             | 50             | 25 | 100        |
| BCA 316                                        | IT Act and Cyber Laws                                             | DSE-4                 | 4    | 1   | 5        | 25             | 75             |    | 100        |
| BCA 318                                        | Mobile Application Development                                    | DSE-4                 | 4    | 1   | 5        | 25             | 50             | 25 | 100        |
| **Skill Enhancement Course (AEEC)              |                                                                   |                       |      |     |          |                |                |    |            |
| BCA 332                                        | Seminar/ Conference Presentation                                  | SEC – 5               | 0    | 0   | 2        | 100            | 0              | 0  | 100        |
| Core Course Practical                          |                                                                   |                       |      |     |          |                |                |    |            |
| BCA 372                                        | Practical – XII IOT Lab                                           | Core Course Practical | 0    | 4   | 2        | 40             | 0              | 60 | 100        |
| BCA374                                         | NSS / NCC / Cultural clubs / Technical Society / Technical club\$ | Mandatory             | -    | -   | 2        | 100            | 0              | 0  | 100        |
|                                                | Total                                                             |                       |      |     | 29       |                |                |    | 800        |

\*Fourth Subject from Discipline specific chosen group

\*\* NUES (Non – University Examination Subject) – Only Internal Assessment by the Institute), that is the assessment shall be conducted by the institution for all 100 marks as Teacher's Continuous Assessment. Evaluation will be based on the presentation on any latest technology/research article in in-house/external seminar/conference and will be conducted by the college committee only.

\*\*\* The student shall do the Major project in the Discipline Specific Area/Curriculum based subject /any emerging technology.

# Generic Elective (GE) for other undergraduate programmes

\$NUES : Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations at the institution / University level; the co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1<sup>st</sup> semester and the evaluation shall be conducted at the end of the 6<sup>th</sup> semester for students admitted in the first semester.

**Note:** Any Elective Subject will be offered if minimum 1/3 rd of the total strength of students in the class will opt for it.



## **Detailed Syllabus of 1<sup>st</sup> Year**





Course Code: BCA 101  
Course Name: Discrete Mathematics

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The objective of this course is to provide the learners with the following:

1. Knowledge about sets, relations and functions.
2. Make them familiar with basics of lattices and graphs.
3. Understanding of the concept of propositional logic.
4. Acquiring the insight of combinatorics and recurrence relations

**PRE-REQUISITES: Basic Concepts of Mathematics**

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                             | BT Level | Mapping to PO #         |
|------|------------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Understand the basics conceptual math and relations.                                     | BTL2     | PO1, PO2, PO3, PO4      |
| CO2  | Understand and apply partial order and recurrence relation and their operations.         | BTL3     | PO1, PO2                |
| CO3  | Compare and design, sorting and hashing techniques.                                      | BTL4     | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Appraise and determine the correct logic and solutions for any given real world problem. | BTL5     | PO1, PO2, PO3, PO4, PO5 |

**UNIT I**

No. of Hours: 13 Chapter/Book Reference: TB1 [chapters 1, 2, 7], TB2 [chapters 1, 2, 4, 5], TB3 [chapters 1, 4]

**SETS:** Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operations on Sets: Union, Intersection difference and Complements of Sets, Algebra of sets, Cartesian product, Simple applications.

**RELATION AND FUNCTIONS:** Properties of Relations, Equivalence Relation, Partial Order Relation, Composition of relations, and Representation of relations using digraph and Matrix, Function: Domain and Range, onto, into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

**PROPOSITIONAL LOGIC:** Introduction, Proposition, First order logic, Basic logical operations, truth tables, tautologies, contradictions, Algebra of Propositions, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

**UNIT II**

No. of Hours: 10 Chapter/Book Reference: TB2 [chapter 6] TB 3 [Chapter 6]



**PARTIAL ORDER RELATIONS AND LATTICES:** Partial Order Sets, Totally ordered set, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal elements, Greatest lower bound, least upper bound, Lattices and Algebraic Structure, Principle of Duality, Elementary Properties of Lattices, Atoms. Sub lattices, Bounded lattice, Distributed & Complemented Lattices, Isomorphic lattices. Boolean lattice.

### **UNIT- III**

**No. of Hours: 11 Chapter/Book Reference:** TB1 [chapters 5, 6], TB2 [chapter 3], TB3 [chapters 2, 3],

**COMBINATORICS:** Introduction, Basic Counting Principles, Permutations, Permutations of things not all different, Circular Permutations, Combinations, Restricted Permutations and Combinations, Derangement, Pascal's Triangle, Binomial Theorem (only for natural Numbers)

**RECURRENCE RELATIONS:** Introduction, Order of Recurrence Relations, Degree of Recurrence Relations, Linear Homogeneous Recurrence Relations, Non Homogeneous Recurrence Relations, Solution of linear homogeneous and non-homogeneous recurrence relations.

### **UNIT -IV**

**No. of Hours: 10 Chapter/Book Reference:** TB1 [chapter 8], TB2 [chapter 8], TB3 [chapter 8]

**GRAPHS:** Introduction, Degree of a vertex of a graph, Handshaking Theorem, types of Graphs, sub graph, Matrix representation of a graph: adjacent and incidence matrices, Isomorphic graphs, path and circuit (Floyd's and Warshall algorithms), Connected graph, Hamiltonian graph, Euler graph, Graph coloring (Vertex, Edges and Map).

### **TEXT BOOKS:**

**TB1.** Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill Education, 8<sup>th</sup> edition 2021,

**TB2.** Kolman, Busby and Ross, "Discrete Mathematical Structures", Pearson, 10<sup>th</sup> edition 2015

**TB3.** Babu Ram, "Discrete Mathematics", Pearson Education, 1<sup>st</sup> edition 2010

### **REFERENCE BOOKS:**

**RB1.** D. S. Malik, M. K. Sen, "Discrete Mathematics" Cengage Learning, 2012

**RB2.** S.K. Sarkar "A Text Book of Discrete Mathematics" S. Chand Publications, 9<sup>th</sup> edition 2019

**RB3.** Singh J. P. "Discrete Mathematics for Undergraduates" ANE Books, 1<sup>st</sup> edition, 2013

**RB4.** Tremblay J.P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill



Course Code: BCA103

Course Name: Programming Using 'C' Language

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

This course will provide the learners the following:-

1. Understanding of the syntax and the semantics of C programming language
2. Building of their logics for solving a given problem.

**PRE-REQUISITES:** None

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                                 | *BT Level | Mapping to PO #         |
|------|------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|
| CO1  | Develop programming skills by learning the fundamentals of structured programming using C Language.                          | BTL2      | PO1, PO2, PO3           |
| CO2  | Design and develop programs using arrays, storage classes, functions and to understand memory management through pointers    | BTL3      | PO1, PO2, PO3           |
| CO3  | Critically analyze real world problems using structures, unions and develop applications for handling text and binary files. | BTL5      | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Explore the use of command line arguments, string manipulation and standard libraries.                                       | BTL5      | PO1, PO2, PO4,          |

**UNIT – I**

**No. of Hours: 12 Chapter/Book Reference: TB1 [1,2,3,4,5,6,7]; TB2 [1,2,3,4,5,6,7]; TB3 [1,2,3,4,5,6]**

C basics: C character set, Identifiers and keywords, Data types, constants, symbolic constants, variable declarations, structure of basic C program, writing and executing the first C program, #include Preprocessor directive, expression statements, compound statements, operators: Arithmetic, Unary, Relational, logical, assignment, shorthand assignment, conditional and bitwise, comma operator.

C control structures: if statement, if...else statement, else if ladder, while, do....while, for, and switch statement, nested control structure, break, labelled break, continue, labelled continue statement, exit statement, goto statement.

**UNIT II**

**No. of Hours: 13 Chapter/Book Reference: TB1 [8,9,10,13,14]; TB2 [8,9,10,12]; TB3 [7,8, 9,10,11,12]**

C Functions: Functions: declaration, definition & scope, recursion, call by value, call by reference. Preprocessor directive: #define, macros with arguments, nested macros, # and ## operators, conditional compilation.

Storage Classes: automatic, external (global), static & registers. Arrays: Arrays (1D, 2D), strings, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions.



### UNIT – III

**No. of Hours: 11 Chapter/Book Reference: TB1 [17,19,20,21]; TB2 [11,13,14]; TB3 [13,14,16]**

Structures: Structures, unions, Enumeration, passing structure to functions, arrays and structures, typed of, difference between structure and union, self-referential structure, bit fields.

File handling [text (ASCII), binary]: file input output operations, file access modes, file pointers, file

Positioning functions (fseek, ftell, rewind etc.)

### UNIT – IV

**No. of Hours: 08 Chapter/Book Reference: TB1 [15,22]; TB2 [9]; TB3 [8]**

Standard library functions from stdio.h, stdlib.h, conio.h, ctype.h, math.h, string.h, process.h., Usage of command line arguments.

#### TEXT BOOKS:

**TB1.** Yashwant Kanetkar, "Let us C" 17<sup>th</sup> edition, 2020.

**TB2.** E. BalaGuruswamy, "Programming in ANSI C", 8<sup>th</sup> edition, 2019.

**TB3.** Ashok N. Kamthane, "Programming in C", Pearson Education, 3<sup>rd</sup> Edition, 2015

#### REFERENCE BOOKS:

**RB1.** K R Venugopal, Sudeep R Prasad, "Mastering C", McGraw Hill Education; 2nd edition, 2017

**RB2.** V Rajaraman, "Computer Programming in C", 2nd Edition, 2019

**RB3.** Kernighan and d. Ritchie, "The ANSI C Programming Language", 2015

**RB4.** Stephen Prata, "C Primer Plus" 6th Edition, 2014

**RB5.** Schaum's Outline Series, "Programming with C", 4th Edition, 2018

**RB6.** Reema Thareja, Programming In C", Oxford University Press, September 2018



Course Code: BCA 105

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Course Name: Fundamentals of Computers and IT

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The objectives of this course is to provide the learners:

1. Awareness of evolution of Computers, various types of computers its characteristics, usage, and limitations.
2. Identification of different categories of computers, their peripherals and memory.
3. Knowledge about operating system, their types, MS-Office various software.
4. Understanding of computer network fundamentals and various communication networks.
5. Overview of emerging technologies in IT i.e. AI and Machine Learning, IOT, Data Analytics etc.

**PRE-REQUISITES:** None

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                                           | *BT Level | Mapping to PO #         |
|------|----------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|
| CO1  | Describe computer with its characteristics, its usage, limitations and benefits, Computer Memories and its type, Software and its type | BTL2      | PO1, PO2, PO3           |
| CO2  | Acquire knowledge about Number Systems, various computer languages and operating system DOS                                            | BTL2      | PO1, PO2, PO3           |
| CO3  | Attain skills in Application Software used for word processing, spreadsheet and presentation                                           | BTL4      | PO1                     |
| CO4  | Understand network fundamentals and various communication network, Advance trends in IT                                                | BTL3      | PO1, PO2, PO3, PO4, PO5 |

**UNIT – I**

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters:1,2,7,8,9], TB2:[Chapters:1,2,3,4];RB1[Chapters:6,7], RB3[Chapters:1a,1b,2a,2b,4a,5a], Fundamentals of Computers:

Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.

**Computer Hardware:** Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.

**Computer Memory:** Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.



## UNIT – II

**No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters: 10,12,14]; TB2 [Chapters:6,7]; RB1[Chapters:6A, 6B, 12A,12B], RB3 [Chapters: 8, 9]**

**Interaction with Computers:**

**Computer Software:** System software: Assemblers, Compilers, Interpreters, linkers, loaders. Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).

**Operating Systems:** Elementary Operating System concepts, Different types of Operating Systems. **DOS:** Booting sequence; Concepts of File and Directory, Types of DOS commands.

**Computer Languages:** Introduction to Low-Level Languages and High-Level Languages.

## UNIT – III

**No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters:3,5,4]; TB2 [Chapters:5]; RB1[Chapter:2]**

**Computer Number System:** Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.

**Binary Arithmetic:** Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

## UNIT – IV

**No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters:17,18]; TB2 [Chapters:9,10]; RB3[7A,7B,8A,8B]**

**Computer Network & Internet:** Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.

**Internet:** Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.

**Advanced Trends in IT Applications** – Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

**TEXT BOOKS:**

**TB1.** P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.

**TB2.** Anita Goel "Computer Fundamentals", Pearson.

**REFERENCE BOOKS:**

**RB1.** B.Ram Computer fundamentals Architecture and Organization, New Age Intl.

**RB2.** Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing.

**RB3.** Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.

**RB4.** Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.



Course Code: BCA 107  
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Course Name: Web Technologies  
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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The objective of this course is to provide the learners the following:

1. Knowledge about the semantic structure of HTML, Javascript, CSS, XML and bootstrap.
2. Ability to compose forms and tables using HTML, Javascript, CSS and Bootstrap.
3. Expertise to design static web pages
4. Skills to create dynamic user interface and perform Client-Side validations using JavaScript

**PRE-REQUISITES:** None

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                       | *BT Level  | Mapping to PO # |
|------|------------------------------------------------------------------------------------|------------|-----------------|
| CO1  | Develop static web pages through HTML, JavaScript, CSS and Bootstrap.              | BTL6       | PO4, PO5        |
| CO2  | Implement different constructs and programming techniques provided by JavaScript.  | BTL3       | PO4, PO8        |
| CO3  | Adapt HTML, Javascript, CSS and Bootstrap syntax and semantics to build web pages. | BTL1, BTL2 | PO4             |
| CO4  | Develop Client-Side Scripts using JavaScript to display the contents dynamically   | BTL3, BTL6 | PO4, PO5        |

**UNIT – I**

**No. of Hours: 11 Chapter/Book Reference:** TB1 [Chapters: 1-3]; TB2 [Chapters: 2]; TB3 [Chapters: 1-4]

**World Wide Web:** Introduction, Web page, Home page, Web site, Static and Dynamic website, Client Server computing concepts. Web Client and Web Server, Web Browser, Client Side and server side Scripting Languages.

**HTML Overview:** Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, lists types of lists, tables, frames and floating frames, Developing Forms, Image maps.

**UNIT – II**

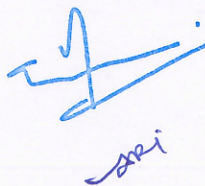
**No. of Hours: 11 Chapter/Book Reference:** TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5-12]; TB4 [Chapters 1-3]

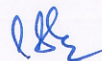
**Cascading Style Sheet:** Types of Style Sheets – Internal, inline and External style sheets, creating styles, link tag, CSS Properties, CSS Styling, Style Selector- Id, class name and Pseudo Class.



**BootStrap Basics:** Introduction to Bootstrap, Responsive web design, Linking with Bootstrap, container class, grids, tables, images, buttons, typography classes, jumbotron, glyphicons,









### UNIT – III

**No. of Hours:11 Chapter/Book Reference: TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5-12]**

**Introduction to Java Script:** Data Types, Control Statements, operators, dialog boxes, Built in and User Defined Functions, Objects in Java Script, Handling Events, basic validations, Document Object Model, Browser Object Model.

### UNIT – IV

**No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters]; TB2 [Chapter: 7, 9]; TB3 [Chapter: 1]**

**XML:** Introduction, Features, XML Naming rules, Building block of XML Document, Difference between HTML & XML, XML Parser, DTD's Using XML with HTML and CSS.

**Web Hosting Concepts:** Concept of domain- Physical domain, virtual domain, registering a domain, need of IP addressing, Web Hosting and Publishing Concepts

#### TEXT BOOKS:

- TB1.** The complete reference HTML and CSS, by Thomas A powell, TMH publication.
- TB2.** Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson
- TB3.** Internet and World Wide Web Deitel HM, Deitel ,Goldberg , Third Edition.
- TB4.** Bootstrap: Responsive Web development, Jake Spurlock, O'reilly, First Edition

#### REFERENCE BOOKS:

- RB1.** HTML Black Book , Stephen Holzner, Wiley Dreamtech.
- RB2.** Rajkamal, "Web Technology", Tata McGraw-Hill, 2001.
- RB3.** Jeffrey C. Jackson, "Web Technologies : A Computer Science Perspective", Pearson.
- RB4.** XML How to Program by Deitel Deitel Nieto.



Course Code: BCA 109  
Course Name: Technical Communication

L T C  
3 1 4

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

This course will provide the learners the following:

1. Understanding of the correct use of English Language.
2. The student will improve in oral as well as written communication skills.

**PRE-REQUISITES: Nil**

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                                | *BT Level | Mapping to PO # |
|------|-----------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|
| CO1  | The student will become familiar with the basics of communication and its importance in the organizational world.           | BTL1      | PO9, PO11       |
| CO2  | To improve the business writing skills also will become well aware how to write effective resume to enter the global world. | BTL2 & 3  | PO9, PO11       |
| CO3  | To improve the listening skills by knowing well how to negotiate and give effective presentations.                          | BTL5      | PO9, PO11       |
| CO4  | To make use of effective business language and give a professional look to oneself.                                         | BTL6      | PO9, PO11       |

**UNIT – I**

**No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3, TB4**

**Concepts and Fundamentals:** Introduction to Technical Communication, Need and importance of communication, channel, Distinction between general and technical communication, nature and features of technical communication, Seven Cs of communication, Types of Technical communication, style in technical communication, technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

**UNIT-II**

**No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3**

**Oral Communication:** Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee. Meetings: Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/committees, Planning and organization of meetings. Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation). The technique of conducting Group Discussion and JAM session.



### UNIT-III

**No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3, TB4**

**Written Communication:** Overview of Technical Writing: Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing,  
Note – Making, Notice, E-mail Writing  
Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters  
Office memorandum, Good news and bad news letters  
Report Writing: Definition & importance; categories of reports, Elements of a formal report, style and formatting in report  
Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements  
Proposal Writing: Purpose, Types, characteristics and structure  
Job Application: Types of application, Form & Content of an application, drafting the application, Preparation of resume.

### UNIT-IV

**No. of Hours: 10 Chapter/Book Reference: TB3, RB1, RB3**

**Soft Skills:** Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle.  
Non-Verbal Communication: Kinesics and Proxemics, Paralanguage  
Interpersonal Skills

**Language Skills:** Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), introduction to Business English.

### TEXTBOOKS:

- TB1.** Kavita Tyagi and Padma Misra , “Advanced Technical Communication”, PHI, 2011  
**TB2.** P.D.Chaturvedi and Mukesh Chaturvedi, “Business Communication – Concepts, Cases and Applications”, Pearson, second edition.  
**TB3.** Rayudu, “C.S- Communication”, Himalaya Publishing House, 1994.  
**TB4.** Asha Kaul , “Business Communication”, PHI, second edition.

### REFERENCES:

- RB1.** Raymond Murphy, “Essential English Grammar- A self study reference and practice book for elementary students of English” , Cambridge University Press, second edition.  
**RB2.** Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.  
**RB3.** Kavita Tyagi and Padma Misra , “Basic Technical Communication”, PHI, 2011.  
**RB4.** Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, “Effective Business Communication”, McGraw Hill, seventh edition.



**Course Code: BCA 171**

**Course Name: Practical -1 'C' Prog. Lab**

**L T/P C**  
**0 4 2**

**LEARNING OBJECTIVES:**

This course will provide the learners the following:-

1. Understanding of the syntax and the semantics of C programming language
2. Building of their logics for solving a given problem.

**PRE-REQUISITES:** None

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                                                                                 | BT Level | Mapping to PO #         |
|------|------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Develop programming skills by learning the fundamentals of structured programming using C Language.                          | BTL3     | PO1, PO2, PO3           |
| CO2  | Design and develop programs using arrays, storage classes, functions and to understand memory management through pointers    | BTL4     | PO1, PO2, PO3           |
| CO3  | Critically analyze real world problems using structures, unions and develop applications for handling text and binary files. | BTL5     | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Explore the use of command line arguments, string manipulation and standard libraries.                                       | BTL5     | PO1, PO2, PO4,          |

**List of Practicals**

| S. No.                                                                        | Detailed Statement                                                                                                                                                                                                                                                      | Mapping to CO # |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Core Practicals (Implement minimum 8 out of 10 practical)</b>              |                                                                                                                                                                                                                                                                         |                 |
| 1.                                                                            | Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.                                                                                                                                                                        | CO1             |
| 2.                                                                            | Write a program to find the greatest number among 3 numbers given by the user.                                                                                                                                                                                          | CO1             |
| 3.                                                                            | Write a program to check if a given number is a prime number or not.                                                                                                                                                                                                    | CO1             |
| 4.                                                                            | Write a program to display the following pattern upto N rows, taking the value of N from the user:<br>1<br>2     3<br>4     5     6<br>7     8     9     10                                                                                                             | CO1             |
| 5.                                                                            | Write a program to input marks of 50 students using an array and display the average marks of the class.                                                                                                                                                                | CO2             |
| 6.                                                                            | Write a program to search for a number entered by the user in a given array and display the array in ascending order.                                                                                                                                                   | CO2             |
| 7.                                                                            | Write a program to check if a string is palindrome or not.                                                                                                                                                                                                              | CO2             |
| 8.                                                                            | Write a program to add, subtract, multiply and divide two numbers using pointers.                                                                                                                                                                                       | CO2             |
| 9.                                                                            | Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user. | CO3             |
| 10.                                                                           | Write a program to create two files with names EvenFile and OddFile. Input 20 numbers from the user and save even numbers in EvenFile and odd numbers in OddFile.                                                                                                       | CO3             |
| <b>Application Based Practicals (Implement minimum 5 out of 10 practical)</b> |                                                                                                                                                                                                                                                                         |                 |
| 11.                                                                           | Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and                                                                                                                 | CO1             |



|                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                     | percentage.                                                                                                                                                                                                                                                                     |          |
| 12.                                                                                                                                                                                                                                                                 | Write a menu driven program to perform the following operations:<br>(i) Print armstrong numbers upto N, (ii) Display prime numbers between 1 to N,<br>(iii) Reverse of an integer                                                                                               | CO1      |
| 13.                                                                                                                                                                                                                                                                 | Write a program to convert a hexadecimal number into a binary number.                                                                                                                                                                                                           | CO1      |
| 14.                                                                                                                                                                                                                                                                 | Write a program to calculate factorial of a number and display fibonacci series upto N terms using recursive functions.                                                                                                                                                         | CO2      |
| 15.                                                                                                                                                                                                                                                                 | Write a program to perform matrix addition, (ii) matrix multiplication, and (iii) Matrix transpose) on 2D arrays.                                                                                                                                                               | CO2      |
| 16.                                                                                                                                                                                                                                                                 | Write a program to make use of arrays with structures in the following ways:<br>(i) Use array as a structure data member<br>(ii) Create array of structure variables                                                                                                            | CO3      |
| 17.                                                                                                                                                                                                                                                                 | Write a program to compare the contents of two files by taking names of the files through command line arguments.                                                                                                                                                               | CO3, CO4 |
| 18.                                                                                                                                                                                                                                                                 | WAP to perform I/O and make use of file positioning functions on Binary files.<br>(using fseek, ftell, rewind functions)                                                                                                                                                        | CO4      |
| 19.                                                                                                                                                                                                                                                                 | Write a menu driven program to implement the following string operations:<br>(i) Calculate length of a string<br>(ii) Concatenate at the end of a given<br>(iii) Copy one string to another<br>(iv) Compare contents of two strings<br>(v) Copy nth character string to another | CO4      |
| 20.                                                                                                                                                                                                                                                                 | Write a program to read time in string format and extract hours, minutes and second also check time validity                                                                                                                                                                    | CO4      |
| <b>Note:</b><br><b>1. In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.</b><br><b>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.</b> |                                                                                                                                                                                                                                                                                 |          |



Course Code: BCA 173

Course Name: Practical – II IT Lab

L T/P C  
0 4 2

**LEARNING OBJECTIVES:**

The objective of this course is to provide the learners :

1. Basic knowledge of computers Software and Hardware
2. Expertise in using DOS Commands.
3. Attain proficiency in using application software for Word Processing, Spreadsheet and Presentation.

**PRE-REQUISITES:** Nil

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                               | BT Level | Mapping to PO # |
|------|----------------------------------------------------------------------------|----------|-----------------|
| CO1  | Work with basic DOS Commands and Windows Explorer.                         | BT3      | PO1, PO2        |
| CO2  | Create Word Documents using advanced features of MS Word.                  | BT3      | PO1,PO2         |
| CO3  | Create Worksheet using advanced features of MS Excel.                      | BT3      | PO1,PO2         |
| CO4  | Create interactive Presentation using advanced features of MS Power-point. | BT3      | PO1, PO2        |

**List of Practicals**

| S. No.                                                            | Detailed Statement                                                                                                                                                                                                                        | Mapping to CO # |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Core Practicals (Implement minimum 10 out of 15 practical)</b> |                                                                                                                                                                                                                                           |                 |
| 1.                                                                | To explore the System settings - Personalisation, System, Devices, Apps, Network & Internet.                                                                                                                                              | CO1             |
| 2.                                                                | To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.                                                                                                                                                              | CO1             |
| 3.                                                                | To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.                                                                                                                                       | CO1             |
| 4.                                                                | To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.                                                                                          | CO2             |
| 5.                                                                | To practice the use of Bullets, numbering, multilevel lists and use of Table Feature- Insert table with rows and columns, draw tables, excel spreadsheet and quick tables etc.                                                            | CO2             |
| 6.                                                                | To practice the use of Insert Features – add picture, Chart, SmartArt, WordArt, Equation, Symbols, Header and Footer, Page Numbering etc. and the use of Design Features – Watermark, Page color, Page Border, Themes implementation etc. | CO2             |
| 7.                                                                | To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.                                                                                                                                        | CO2             |
| 8.                                                                | To practice the use of Mail Merge Feature to generate Envelops and Labels.                                                                                                                                                                | CO2             |
| 9.                                                                | To practice the use of Excel basic formatting features – Wrap Text, Insert and Delete (Cells, Sheet, Row or Column), Format – Cell Height, Cell Width, Hide, Un Hide Cell, Protection, Freeze and Unfreeze panes, Macros etc.             | CO3             |
| 10.                                                               | To practice the use of Insert Features- Pivot Table, Pivot Chart, Picture, Chart and its formatting and Design and the use of Page Layout Features- Margins, Orientation, Page Break , Background, Height and Width of Cells.             | CO3             |
| 11.                                                               | To practice the use of Formula Features – user defined function, predefined functions – Logical, Date, Time, Maths and the use of Data Manipulation Features – Sort, Filter, Advanced Filters, Whatif analysis.                           | CO3             |
| 12.                                                               | To practice the creation of Blank presentation and Selecting Themes and the use of the basic design features – Adding New Slides, Reuse slides, Slides layout etc.                                                                        | CO4             |



|                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                            |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                                                                                                                                                                                                                                                                     | To practice the use of Insert Features – add pictures, screenshots, shapes, wordart, audio, video, date-time etc. and use of Design Features- Changing the theme of presentation, format background and design ideas.      | CO4 |
| 14.                                                                                                                                                                                                                                                                 | To practice the use of Transition features to be applied on Slides content, setting sound, duration etc. and the use of Animation Features to be applied on presentation of Slide, set animation timings and rehearse etc. | CO4 |
| 15.                                                                                                                                                                                                                                                                 | To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.                                                                                                                                       | CO4 |
| <b>Application Based Practicals (Implement minimum 5 out of 8 practical)</b>                                                                                                                                                                                        |                                                                                                                                                                                                                            |     |
| 16.                                                                                                                                                                                                                                                                 | Create a Folder by your name in your system, store all the work done in this semester inside that folder.                                                                                                                  | CO1 |
| 17.                                                                                                                                                                                                                                                                 | Create your Resume using basic formatting features like : table, bullets, wordart etc                                                                                                                                      | CO2 |
| 18.                                                                                                                                                                                                                                                                 | Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.                                                                                                                        | CO2 |
| 19.                                                                                                                                                                                                                                                                 | Write an Article for Magazine with 3 columns and hyperlink.                                                                                                                                                                | CO2 |
| 20.                                                                                                                                                                                                                                                                 | Create your own marksheet using basic formatting features.                                                                                                                                                                 | CO3 |
| 21.                                                                                                                                                                                                                                                                 | Create a list of marks of 10 students create charts and pivot table.                                                                                                                                                       | CO3 |
| 22.                                                                                                                                                                                                                                                                 | Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.                                                                                                                                    | CO3 |
| 23.                                                                                                                                                                                                                                                                 | Create a Power Point Presentation on any topic of your choice using animation and transition features.                                                                                                                     | CO4 |
| <b>Note:</b><br><b>1. In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.</b><br><b>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.</b> |                                                                                                                                                                                                                            |     |



**Course Code: BCA 175**  
**Course Name: Practical-III Web Tech Lab**

**L T/P C**  
**0 4 2**

**LEARNING OBJECTIVES:**

In this course, the learners will be able to develop expertise related to:

1. Apply the Semantic Structure of HTML, javascript, CSS, bootstrap and XML
2. Design forms and tables using HTML, CSS and bootstrap.
3. Design Client-Side programs using JavaScript
4. Design and develop static Web page.

**PRE-REQUISITES:** None.

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                                            | BT Level  | Mapping to PO # |
|------|-----------------------------------------------------------------------------------------|-----------|-----------------|
| CO1  | Develop static web pages through HTML, CSS, JavaScript, bootstrap and XML.              | BTL3      | PO4, PO5        |
| CO2  | Implement different constructs and programming techniques provided by JavaScript.       | BTL1,BTL3 | PO4, PO8        |
| CO3  | Adapt HTML, CSS, javascript, bootstrap and XML syntax and semantics to build web pages. | BTL1,BTL5 | PO4             |
| CO4  | Develop Client-Side Scripts using JavaScript to display the contents dynamically        | BTL3      | PO4,PO5         |

**List of Practicals**

| S. No.                                                          | Detailed Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mapping to CO #                                                 |                                                      |  |         |          |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------|--|---------|----------|
| Core Practicals                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                 |                                                      |  |         |          |
| 1.                                                              | <p>Make following five different web pages:</p> <ul style="list-style-type: none"><li>i. Formatting Styles and Headings: Include Bold, italics, Underline, Strike, Subscript, superscript and all six type of headings</li><li>ii. Font Styles and Image tag</li><li>iii. Marquee: Move text, image and hyperlink</li><li>iv. Other tags: br, hr, pre, p</li></ul> <p>Include following specifications:</p> <ul style="list-style-type: none"><li>• In all these web pages only mention about use, attributes apply them.</li><li>• Insert a background image on home page</li><li>• Make all the topics as hyperlinks and go to some other page for description</li><li>• Insert a marquee showing HTML Tutorial as moving text.</li><li>• Use different font style for different topics</li><li>• On every page, make a hyperlink for going back to home page and internal link also.</li></ul> | CO1, CO3                                                        |                                                      |  |         |          |
| 2.                                                              | <p>Create an unordered list nested inside ordered list and apply the following :</p> <ul style="list-style-type: none"><li>• Insert an image of Main item on top right corner of web page.</li><li>• Display heading as a marquee.</li><li>• Use different font styles and colors for different ordered list items.</li><li>• Insert horizontal line after each ordered item.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO1, CO3                                                        |                                                      |  |         |          |
| 3.                                                              | <p>Design a table with row span and column span and make use of attributes colspan, rowspan, width, height, cellpadding, cellspacing etc.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CO1, CO3                                                        |                                                      |  |         |          |
| 4.                                                              | <p>Design following frame:</p> <table><tr><td>MAIN MENU<br/><u>Topic 1</u><br/><u>Topic 2</u><br/><u>Topic 3</u></td><td>Explanation<br/>-----<br/>-----<br/><u>View Example</u></td></tr><tr><td></td><td>Example</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MAIN MENU<br><u>Topic 1</u><br><u>Topic 2</u><br><u>Topic 3</u> | Explanation<br>-----<br>-----<br><u>View Example</u> |  | Example | CO1, CO3 |
| MAIN MENU<br><u>Topic 1</u><br><u>Topic 2</u><br><u>Topic 3</u> | Explanation<br>-----<br>-----<br><u>View Example</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                 |                                                      |  |         |          |
|                                                                 | Example                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                 |                                                      |  |         |          |
| 5.                                                              | <p>Make an image map showing the usage of shape, coords, href attributes in map</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CO1, CO3                                                        |                                                      |  |         |          |



|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                        | definition. Link each hotspot to their respective details. All the web pages should be designed with proper background color, images, font styles and headings.                                                                                                                       |          |
| 6.                                                                                                                                                                                                                                                     | Design Student registration form for admission in college.                                                                                                                                                                                                                            | CO1, CO3 |
| 7.                                                                                                                                                                                                                                                     | Create a webpage and show the usage of inline and internal style sheet and external style sheet?                                                                                                                                                                                      | CO1, CO3 |
| 8.                                                                                                                                                                                                                                                     | Create a webpage containing a background image and apply all the background styling attributes?                                                                                                                                                                                       | CO1, CO3 |
| 9.                                                                                                                                                                                                                                                     | Create a web page showing the usage of font styling attributes                                                                                                                                                                                                                        | CO1, CO3 |
| 10.                                                                                                                                                                                                                                                    | Create a web page and apply all Text styling attributes use Id and class selector.                                                                                                                                                                                                    | CO1, CO3 |
| 11.                                                                                                                                                                                                                                                    | Create a webpage and implement all list styling attributes.                                                                                                                                                                                                                           | CO1, CO3 |
| 12.                                                                                                                                                                                                                                                    | Create a Webpage with three equal columns.                                                                                                                                                                                                                                            | CO1, CO3 |
| 13.                                                                                                                                                                                                                                                    | Create a webpage containing bootstrap table.                                                                                                                                                                                                                                          | CO1, CO3 |
| 14.                                                                                                                                                                                                                                                    | Create a webpage containing various types of images.                                                                                                                                                                                                                                  | CO1, CO3 |
| 15.                                                                                                                                                                                                                                                    | Create a webpage containing various types of buttons                                                                                                                                                                                                                                  | CO1, CO3 |
| 16.                                                                                                                                                                                                                                                    | Create a webpage containing various, typography classes.                                                                                                                                                                                                                              | CO1, CO3 |
| 17.                                                                                                                                                                                                                                                    | Create a webpage containing to display the heading using. Jumbotron.                                                                                                                                                                                                                  | CO1, CO3 |
| 18.                                                                                                                                                                                                                                                    | Write a program to show the usage of inbuilt functions and dialog boxes.                                                                                                                                                                                                              | CO2      |
| 19.                                                                                                                                                                                                                                                    | Write a program to show the usage of alert box and confirm box                                                                                                                                                                                                                        | CO2      |
| 20.                                                                                                                                                                                                                                                    | Write a program to implement event handling using onclick, onmouseover and onmouseout events.                                                                                                                                                                                         | CO2      |
| 21.                                                                                                                                                                                                                                                    | Write a program to show the usage of all the date, math and string object functions                                                                                                                                                                                                   | CO2      |
| 22.                                                                                                                                                                                                                                                    | WAP to display the bookstore details in XML with CSS and internal DTD.                                                                                                                                                                                                                | CO1, CO3 |
| 23.                                                                                                                                                                                                                                                    | WAP to format the Teacher details in XML with CSS using external DTD                                                                                                                                                                                                                  | CO1, CO3 |
| <b>Application Based Practical</b>                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                       |          |
| 24.                                                                                                                                                                                                                                                    | Design the registration form for a web site and when the user clicks on submit button the login form should be appeared on the screen (use external javascript file).                                                                                                                 | CO4      |
| 25.                                                                                                                                                                                                                                                    | Design a website and apply all the features of HTML, css, javascript and bootstrap to make the website attractive.                                                                                                                                                                    | CO4      |
| 26.                                                                                                                                                                                                                                                    | Write a JavaScript function that creates a table, accept row, column numbers from the user, and input row-column number as content (e.g. Row-0 Column-0) of a cell.                                                                                                                   | CO2      |
| 27.                                                                                                                                                                                                                                                    | Zebra-striped Tables: Setting different background colors for alternate rows is a popular technique to improve the readability of tables that has large amount of data. This is commonly known as zebra-stripping a table. Make use of pseudo classes to create zebra stripped Table. | CO2      |
| 28.                                                                                                                                                                                                                                                    | Create a Questionnaire related to any topic of your choice by using Form Elements.                                                                                                                                                                                                    | CO4      |
| <b>Note:</b><br>1. In total 15 practicals to be implemented. 2 additional practical may be given by the course instructor.<br>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course. |                                                                                                                                                                                                                                                                                       |          |



Course Code: BCA 181+  
Course Name: Bridge Course in Mathematics

L T C  
2 0 0

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**Aim:** To build mathematical aptitude of the students for understanding the basic concepts of core courses of mathematics of the programme.

**LEARNING OBJECTIVES:**

The objectives of this course is to provide the learners

- The knowledge about the matrices, determinants and limits.
- Familiarity with basic concepts of differential and integral calculus.

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                                                  | BT Level | Mapping to PO #         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Understand the various approaches dealing the data using theory of matrices                                                                   | BTL2     | PO1, PO2, PO3, PO4      |
| CO2  | Understand and apply the concepts of determinants                                                                                             | BTL3     | PO1, PO2                |
| CO3  | Understand the concept of calculus such as limit, continuity and differentiability.                                                           | BTL4     | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Appraise and determine the correct logic and solutions for any given real world problem using application of integration & integral calculus. | BTL5     | PO1, PO2, PO3, PO4, PO5 |

**UNIT-I**

No. of Hrs. 10 Chapter/Book Reference: TB2 [chapters 8, 9, 10 24, 25, 26, 27], TB3 [chapter 1]

**MATRICES:** Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition, multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication, invertible matrix.

**DETERMINANTS:** Determinant of a square matrix (up to  $3 \times 3$  matrices), properties of determinants, minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix, solving system of equations using matrix method, Cramer rule (only two and three unknown).

**INTRODUCTION TO TRIGONOMETRIC FUNCTIONS:** Degree and radian measurements of an angle, Quadrant system, allied angles, and Simple problems based: on Sum/difference of angles of  $t$  functions,  $C$  and  $D$  Formulae,  $t$  functions of multiple angles.

**UNIT-II**

No. of Hrs. 12 Chapter/Book Reference: TB1 [chapters 4, 12] TB2 [chapters 29, 30, 35, 36] TB3 [3, 4, 5, 13]

**LIMITS, CONTINUITY AND DIFFERENTIABILITY:** : Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions( simple problems only) , derivative of implicit



functions. Concept of exponential and logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives (simple problems only)

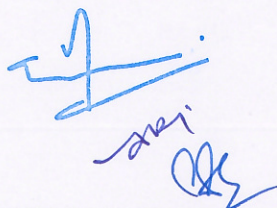
**INTEGRATION:** Integral as Limit of Sum, Riemann Sum, Fundamental Theorem of Calculus, Indefinite Integrals, Simple problems based on Methods of Integration Substitution, By Parts, Partial Fractions, Integration of Algebraic and transcendental Functions.

**TEXT BOOKS:**

- TB1.** Mathur A B, Jaggi V P "A Textbook of Engineering Mathematics" Khanna Publishers, 3<sup>rd</sup> edition, 2000
- TB2.** Dass H K "Applied Mathematics for polytechnics" CBS publishers, 10<sup>th</sup> edition, 2010
- TB3.** Singh J P "Calculus" ANE Books, 2<sup>nd</sup> edition 2012

**REFERENCE BOOKS:**

- RB1.** Kresyig E., "Advanced Engineering Mathematics", 5th Edition, John Wiley & Sons, 1999
- RB2.** H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, Latest Edition.
- RB3.** Grewal B S, "Elementary Engineering Mathematics", 34th Edition. 1998.





Course Code: BCA 102  
Course Name: Applied Mathematics

L T C  
3 1 4

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The objectives of this course are to provide the learners with the following:

1. The Knowledge of mathematical probability
2. Understanding of various numerical techniques
3. Familiarity with the Linear Programming and its applications

**PRE-REQUISITES: Basic Concepts of Mathematics**

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                           | BT Level | Mapping to PO #         |
|------|--------------------------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Understand the various approaches dealing the data using theory of Probability                         | BTL2     | PO1, PO2, PO3, PO4      |
| CO2  | Understand various numerical techniques and apply them to solve real life problems                     | BTL3     | PO1, PO2                |
| CO3  | Analyse and evaluate the accuracy of common Numerical Methods                                          | BTL4,5   | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Develop a mathematical model for real life situation and solving it Using Linear programming technique | BTL5     | PO1, PO2, PO3, PO4, PO5 |

**UNIT -I**

No. of Hrs. 12 Chapter/Book Reference: TB2 [chapters 3, 4], TB3 [chapters 2, 3, 4, 5, 6]

**PROBABILITY:** Introduction, Axiomatic definition of Probability, Addition Theorem, Multiplication theorem, Conditional Probability, Baye's Theorem and its applications

**PROBABILITY DISTRIBUTIONS:** Random Variable, Probability Mass function, Probability density function, Mathematical Expectations of a Random Variable, Binomial Distribution, Poisson distribution, Normal Distribution.

**UNIT -II**

No. of Hrs. 10 Chapter/Book Reference: TB1 [chapters 2, 3], TB3 [chapters 7, 8, 9]

**INTERPOLATION:** Operators: Shift; Forward Difference, Backward Difference Operators and their Interrelation, Interpolation Formulae-Newton's Forward, Backward and Divided Difference Formulae: Lagrange's Formula

**SOLUTIONS OF NON LINEAR EQUATIONS:** Bisection Method, False Position Method, Newton – Raphson

Method for Solving Equation Involving One Variable only.



### UNIT -III

No. of Hrs. 10 Chapter/Book Reference: TB1 [chapters 5, 6], TB3 [chapters 10, 11]

**SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS:** Gaussian Elimination Method with and without Row Interchange; LU Decomposition; Gauss - Jacobi and Gauss-Seidel Method; Gauss - Jordan Method and to find Inverse of a Matrix by this Method.

**NUMERICAL DIFFERENTIATION:** First and Second Order Derivatives at Tabular and Non-Tabular Points,

**NUMERICAL INTEGRATION:** Trapezoidal Rule, Simpsons 1/3 Rule: Error in Each Formula (without proof.)

### UNIT -IV

No. of Hrs. 12 Chapter/Book Reference: TB4 [Chapters 2, 3, 4, 9, 10]

**LINEAR PROGRAMMING:** Formulation of linear Programming model, Graphical method of solving linear Programming problem, Simplex Method (Maximization and Minimization)

**TRANSPORTATION & ASSIGNMENT PROBLEM:** General structure of transportation problem, solution procedure for transportation problem, methods for finding initial solution, test for optimality. Maximization of transportation problem, unbalanced transportation problem, Assignment problem approach of the assignment model, solution methods of assignment problem, maximization in an assignment, unbalanced assignment problem, restriction on assignment

#### TEXT BOOKS:

- TB1. S.S. Sastry, "Numerical Analysis"; Prentice Hall of India, 1998.
- TB2. Johnson, R., Miller, I. and Freunds, J., Miller and Freund's "Probability and Statistics for Engineers, Pearson Education (2005) 7th Ed.
- TB3. Singh J P "Probability and Numerical Methods" ANE Books, 4<sup>th</sup> Edition 2019
- TB4. Sharma, J.K.; Operations Research: problems & solutions; Macmillan India

#### REFERENCE BOOKS:

- RB1. Grewal B S "Numerical Methods in Engineering and Science" Khanna Publishers, 2012
- RB2. Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson Education (2007) 8th Ed.
- RB3. Gupta S C, Kapoor V K "Fundamental of Mathematical Statistics" Sultan Chand and Sons 11th edition 2002
- RB4. Manmohan, Gupta, P K, Kanti Swarup "Introduction to Management science operations research" Sultan Chand and Sons



Course Code: BCA 104  
Course Name: Web Based Programming

L T C  
3 1 4

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The objectives of this course are to provide the learners expertise in the following:-

1. Understanding of the syntax and semantics of PHP language
2. Ability to design and develop web applications using PHP as a server side language.
3. Performing CRUD operations in the database

**PRE-REQUISITES:**

1. Basic knowledge of HTML, CSS and Javascript.
2. Skills to Design static Webpage.

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                 | BT Level   | Mapping to PO #          |
|------|--------------------------------------------------------------------------------------------------------------|------------|--------------------------|
| CO1  | Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's. | BTL3, BTL4 | PO1, PO2, PO3, PO7       |
| CO2  | Have a good understanding of Web Application Terminologies                                                   | BTL1, BTL2 | PO1, PO2, PO3, PO7, PO10 |
| CO3  | Learn how to link and publish web sites                                                                      | BTL1, BTL2 | PO1, PO2, PO3, PO4       |

**UNIT – I**

**No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 1-3, 5]**

Introduction to web applications, Client Side Scripting Vs Server Side Scripting, Web Servers : Local Servers and Remote Servers, Installation Process - WAMP, LAMP, XAMPP & MAMP Server, Static website vs Dynamic website development.

**Introduction to PHP:** Data types, Variables, Super Global Variables, Constants, Comments, Operators and Expressions, Regular Expression, Advantages of PHP

**Control statements:** Conditional Statement -if else, if elseif else, nested if, switch case, PHP Loops – for, while, do while and foreach loop

**Arrays:** Indexed Array, Associate Array, Multi-dimensional Array, Array pre-defined Functions

**UNIT – II**

**No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 7]**

**Functions:** Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions, variable scope, Mail function, PHP Errors

**Working with Forms:** Get and Post Methods, HTML form controls and PHP, State Management: Cookies, Session, Query String, Hidden Field.



### UNIT – III

**No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 6]**

**Working With Files:** Opening and Closing Files, creating directories and files, Reading and Writing to Files, file inclusion, file uploading and downloading, Getting Information on Files.

**Object Oriented Features:** Classes and Objects, Building Classes, Access Modifiers, Reusability, Constructors, Destructor.

### UNIT – IV

**No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 8]**

**PHP Database Connectivity:** Using PHP to Access a Database, Relational Databases and SQL, PHP Data Objects, MySQLi Object Interface, SQLite, MongoDB

Introduction to MYSQL, Creating database and other operations on database, Querying a MySQL database with PHP database, connecting to a database, Parsing of the query results, Checking data errors.

#### TEXT BOOKS:

**TB1.** Programming PHP: Creating Dynamic Web Pages, Kevin Tatroe. Peter Macintyre, Rasmus Lerdorf, O'Reilly, Third Edition

#### REFERENCE BOOKS:

**RB1.** Professional PHP Programming, Jesus Castagnetto, Harish Rawat, Sascha Schumann, Chris Scollo, Deepak Veliath - Wrox Publications

**RB2.** PHP 5 Advanced, Larry Ullman, Peachpit Press

**RB3.** Core PHP Programming. Leon Atkinson (Prentice Hall, ISBN 0130463469).

**RB4.** Beginning PHP5 and MySQL: From Novice to Professional, W. Jason Gilmore, 2004, Apress, ISBN: 1-893115-51-8



Course Code: BCA 106

Course Name: Data Structure and Algorithm Using C

L T C  
3 1 4

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

In this course, the learners will be provided expertise in

1. Understanding of the basic concepts of data structures and their operations like, insertion, deletion, searching and sorting
2. Design algorithms and pseudo codes of various linear and non-linear data structures

**PRE-REQUISITES:**

1. C Programming Skills
2. Discrete Mathematics

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                                        | BT Level | Mapping to PO #         |
|------|-------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Familiarize the basics of data structures and algorithms.                           | BTL2     | PO1, PO2, PO3, PO4      |
| CO2  | Understand and apply linear and nonlinear data structures and their operations.     | BTL3     | PO1, PO2, PO3, PO4, PO5 |
| CO3  | Compare and implement searching, sorting and hashing techniques.                    | BTL5     | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Appraise and determine the correct data structure for any given real world problem. | BTL5     | PO1, PO2, PO3, PO4, PO5 |

**UNIT – I**

No. of Hours: 14 Chapter / Book Reference: TB1 [Chapters 1, 4, 9], TB2 [Chapters 1, 6, 7], TB3 [Chapters 1, 2, 6, 10]

**Linear Data Structures- Static:** Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.

**Arrays:** Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.

**Searching and Sorting:** Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.

**Hashing:** Hash Table, Hash Functions, and Collision Resolution.

**UNIT – II**

No. of Hours: 10 Chapter / Book Reference: TB1 [Chapter 5], TB2 [Chapter 4], TB3 [Chapter 3]

**Linear Data Structures- Dynamic**

**Introduction:** Dynamic Memory Allocation, Dynamic Memory versus Static Memory Allocation.

**Linked List Types:** Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List.

**Operations:** Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.



### UNIT – III

**No. of Hours: 09 Chapter / Book Reference: TB1 [Chapter 6], TB2 [Chapters 2, 4], TB3 [Chapters 4, 5]**

**Abstract Data Types:**

**Stacks:** Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.

**Queues:** Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

### UNIT – IV

**No. of Hours: 11 Chapter / Book Reference: TB1 [Chapters 7, 8], TB2 [Chapters 5, 8], TB3 [Chapters 7, 8]**

**Non Linear Data Structures:**

**Introduction to Graphs:** Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.

**Trees:** Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations

**Introduction and Creation (Excluding Implementation):** AVL Tree, Heap Tree, M- Way Tree, and B Tree.

### TEXT BOOKS:

**TB1.** Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.

**TB2.** Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.

**TB3.** D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

### REFERENCE BOOKS:

**RB1.** Ashok N kamthane "Introduction to Data Structures in C", Pearson, Third Edition, 2009.

**RB2.** E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.

**RB3.** D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.

**RB4.** Y. Kanetkar "Data Structures through C", BPB Publication, Third Edition, 2019.

**RB5.** R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.

**RB6.** A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.



Course Code: BCA 108  
Course Name: Database Management System

L T C  
3 1 4

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

The paper aims to introduce the concept of Back end, data storage in computers, design of a DBMS, Queries to construct database, store and retrieve data from the database. The objective of this course is to provide the learners expertise in the following:

1. Understanding of the requirement of database management System for storing data and its advantages over file management system.
2. Designing the database conceptually, physically and finally implementing the creation of database for any application.
3. Learning of queries in SQL for creating database and performing various operations for manipulating data in the database.
4. Knowledge of database utilities i.e. backup, recovery, transaction processing.

**PREREQUISITE:** Basic knowledge of data storage and file management system

**COURSE OUTCOMES (COS):**

After completion of this course, the learners will be able to: -

| CO # | Detailed Statement of the CO                                                                                                                                                                                                                                 | BT Level | Mapping to PO #         |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Understand the DBMS concepts with detailed architecture, characteristics. Describe different database languages and environment and learn various data models, along with the related terminologies                                                          | BTL1     | PO1, PO2, PO3, PO7      |
| CO2  | Explore Structure Query Language, a brief on NOSQL, Query By Example. Also understand the overview of SQL, and try to implement DDL, DML and DCL along with operators, use of joins, nested query, use of views and Indexes<br>Discuss Integrity Constraints | BTL3     | PO1, PO2, PO3, PO7      |
| CO3  | Describe Relational Data Model, explain Codd's Rules, Relational Algebra, Set theory operations and the concept of functional dependencies and normalization                                                                                                 | BTL4     | PO1, PO2, PO3, PO4      |
| CO4  | Acquire Knowledge about Transaction Processing, concurrency problems, and its controlling techniques, Database backup and recovery and security.                                                                                                             | BTL2     | PO2, PO3, PO4, PO7, PO8 |



### UNIT-I

[No. of Hrs.: 10] Chapter/Book Reference: TB1 [Chapter 2]; TB2 [Chapter 1]

**Introduction:** An overview of database management system, Characteristics of database approach, DBMS architecture, client/server, data Models, Introduction to Distributed Data processing, schema and instances, data independence,

**Data Modelling using Entity Relationship Model:** Basic introduction about the terminologies like Entity, Entity types, entity set, notation for ER diagram, attributes and keys, Types of attributes (composite, derived and multivalued attributes) and keys (Super Key, candidate key, primary key), relationships, relation types, weak entities, enhanced E-R, specialization and generalization.

### UNIT – II

[No. of Hrs.: 13] Chapter/Book Reference: TB1 [Chapter 8]; TB2 [Chapter 2];

**Introduction to SQL:** Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.

**Types of SQL commands:** DDL, DML, DCL. Basic SQL Queries.

**Logical operators:** BETWEEN, IN, AND, OR and NOT

**Null Values:** Disallowing Null Values, Comparisons Using Null Values

**Integrity constraints:** Primary Key, Not NULL, Unique, Check, Referential key

Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses,

**Joins:** Inner joins, Outer Joins, Left outer, Right outer, full outer joins.

Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

### UNIT – III

[No. of Hrs.: 12] Chapter/Book Reference: TB1 [Chapter 7 & 15]; TB2 [Chapter 3];

**Relational Data Models:** Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key constraints and constraints on null, relational DB schema. Codd's Rules

**Relational algebra:** Basic operations selection and projection,

**Set Theoretic operations:** Union, Intersection, set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, specification, quantifiers)

**Join operations:** Inner, Outer, Left outer, Right outer, and full outer join

**ER to relational mapping:** Steps to map ER diagram to relational schema

**Data Normalization:** Functional dependencies, Armstrong's inference rule, & Normalization (Upto BCNF)

### UNIT – IV

[No. of Hrs.: 9] Chapter/Book Reference: TB1 [Chapter 19 & 20]; TB2 [Chapter 5];

**Transaction Processing:** Definition of Transaction, Desirable ACID properties

**Database recovery and Database Security:** System failure, Backup & recovery Techniques, Authentication, Authorization.

Overview of Query by Language, NoSql databases

### TEXT BOOKS:

TB1. R. Elmarsri and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.

TB2. Singh S.K., "Database System Concepts, design and application", Pearson Education [TB3] TB3. Ramakrishnan and Gherke, "Database Management Systems", TMH.

TB4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

### REFERENCE BOOKS:

RB1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6<sup>th</sup> Edition, McGraw Hill, 2010.

RB2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.

RB3. A. K. Majumdar, P. Battacharya, "Database Management Systems", TMH, 2017.



Course Code: BCA 110  
Course Name: Environmental Studies

L T C  
2 0 2

**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**LEARNING OBJECTIVES:**

In this course, the learners will be able to develop expertise related to the following:

1. Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
2. Acquisition of values and attitudes towards understanding complex environmental economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.
3. Encouraging adoption of sustainability as a practice in life, society, and industry.

**PRE-REQUISITES:** Basic awareness about the natural environment.

**COURSE OUTCOMES (COs):** After completion of this course, the learners will be able to:

| CO# | Detailed Statement of the CO                                                                                                                                                                                              | BT Level | Mapping to PO # |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|
| CO1 | Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.                                                                                                                          | BTL1,2   | PO10            |
| CO2 | Understand the consequences of human actions on the web of life, global economy, and quality of human life.                                                                                                               | BTL3     | PO10            |
| CO3 | Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. | BTL3     | PO10            |
| CO4 | Acquire values and attitudes towards understanding complex environmental economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.                   | BTL4     | PO10            |
| CO5 | Adopt sustainability as a practice in life, society, and industry.                                                                                                                                                        | BTL5     | PO10            |

**UNIT-I**

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1, 6]; TB2 [Chapters 8, 11, 25]; TB3 [Chapters 1, 35]

**Introduction to Environmental Studies**

- Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere.
- Scope and importance; Concept of sustainability and sustainable development
- Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.



- International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

#### UNIT-II

**No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 2, 3]; TB2 [Chapters 2, 15, 16, 17]; TB3 [Chapters 2, 7, 11, 12]**

##### **Ecosystems and Natural Resources**

- Definition and concept of Ecosystem
- Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis.
- Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source

#### UNIT-III

**No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 4]; TB2 [Chapters 4, 5, 6]; TB3 [Chapters 22, 23, 24]**

##### **Biodiversity and Conservation**

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.
- Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

#### UNIT-IV

**No. of Hours: 9 + 5 for field visit Chapter/Book Reference: TB1 [Chapter 5]; TB2 [Chapters 7, 20, 21, 23]; TB3 [Chapters 25, 26, 27, 28, 30, 31]**

##### **Environmental Pollution and Control Measures**

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
- Nuclear hazards and human health risks
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.; Waste segregation and disposal
- Environmental Impact Assessment and Environmental Management System
- **Field work/ Practical's (any one)**
- Field visit to any of the ecosystems found in Delhi like Delhi Ridge/ Sanjay lake/Yamuna river and its floodplains etc., or any nearby lake or pond, explaining the theoretical aspects taught in the class room
- Visit to any biodiversity park/ reserve forest/ protected area/ zoo/ nursery/ natural history museum in and around Delhi, such as Okhla bird sanctuary/ Asola Bhatti Wildlife Sanctuary/ Yamuna Biodiversity Park/ Sultanpur National Park, explaining the theoretical aspects taught in the classroom
- Visit to a local polluted site (urban/rural/industrial/agricultural), wastewater treatment plants, or landfill sites, etc



**TEXT BOOKS:**

- TB1.** Sanjay Kumar Batra , Kanchan Batra ,Harpreet Kaur; Environmental Studies; Taxmann's, Fifth Edition.  
**TB2.** M.M. Sulphrey; Introduction to Environment Management; PHI Learning, 2019  
**TB3.** S.P. Mishra, S.N. Pandey; Essential Environmental Studies; Ane Books Pvt. Ltd. ; Sixth Edition.

**REFERENCE BOOKS:**

- RB1.** Asthana, D. K. (2006).Text Book of Environmental Studies. S. Chand Publishing.  
**RB2.** Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India  
**RB3.** Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.  
**RB4.** Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). Environment Reader for Universities, Centre for Science and Environment, New Delhi.  
**RB5.** Masters, G. M., & Ela, W. P. (1991).Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.  
**RB6.** Odum, E. P., Odum, H. T., & Andrews, J. (1971).Fundamentals of ecology. Philadelphia: Saunders.  
**RB7.** Sharma, P. D., & Sharma, P. D. (2005).Ecology and environment. Rastogi Publications



Course Code: BCA 134

Course Name: Front End Design Tools VB.NET

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

**PRE-REQUISITES:** Prior knowledge of programming language is beneficial but not mandatory.

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                        | BT Level | Mapping to PO # |
|------|---------------------------------------------------------------------|----------|-----------------|
| CO1  | Design Console application using basic programming concepts.        | BT3      | PO3, PO5        |
| CO2  | Design Windows application using control.                           | BT3      | PO3,PO5         |
| CO3  | Understand and use of different Data Structures, Exception Handling | BT2      | PO3,PO5         |
| CO4  | Learn basic concepts of OOPS. Design classes and interfaces.        | BT2      | PO3, PO5        |

**SYLLABUS**

**UNIT I**

Introduction to Visual Basic .Net Framework - .Net Architecture, Features of .Net, Advantages of .Net, .Net Framework, CLR, CTS, CLS, Assemblies, Memory management issues – Garbage Collector and collection process.

Introduction to Visual Basic.Net IDE: Creating a project, Types of project in .Net, Exploring and coding a project, Solution explorer, toolbox, properties window, Output window, Object Browser.

Programming Basics: Variable, Data Types, Conditional Constructs, Loop Statements, Creating Console Application.

**UNIT II**

Introduction to GUI Environment and understand the working of commonly used controls - their properties, methods and events.

**UNIT III**

Introduction to Data Structures: Array, ArrayList, Structure and Enumeration.

Introduction of Exception handling - structured and unstructured.

**UNIT IV**

Procedure and function. Introduction to Object Oriented Programming : OOPS Concepts, Creation of Class, Interface and Namespace.

| List of Practicals                                          |                                                                                                                                                   |                 |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| S. No.                                                      | Detailed Statement                                                                                                                                | Mapping to CO # |
| Core Practicals (Implement minimum 10 out of 15 practicals) |                                                                                                                                                   |                 |
| 1.                                                          | Create console application showing the use of conditional constructs - if, if-else, if-elseif-else, nested if, select case.                       | CO1             |
| 2.                                                          | Create console application showing the use of loops –Do While..Loop, Do Until ... Loop, While... Wend, For ... Next, For Each ... Next.           | CO1             |
| 3.                                                          | Create a simple windows application showing the use of TextBox, Button, Label Controls, Radio Button, Check Box, Combo Box and List Box Controls. | CO2             |
| 4.                                                          | Create a windows application showing the use of Image, Timer, Panel, Scroll bar, Status Bar Controls.                                             | CO2             |
| 5.                                                          | Create an MDI application showing the use of multiple forms, toolbar, menu, status bar, RichText Box, Dialog Controls.                            | CO2             |



|                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                                                                                                                                                                                                                                                                                                                            | Create console/windows application to showing the use of Structured Exception handling- try..end try, catch, finally.                                                                                                                                                                                                                                                                                       | CO3 |
| 7.                                                                                                                                                                                                                                                                                                                         | Create console/windows application to showing the use of Unstructured Exception handling- On Error, Resume Next etc.                                                                                                                                                                                                                                                                                        | CO3 |
| 8.                                                                                                                                                                                                                                                                                                                         | Create console/windows application showing the use of Array class - its methods and properties.                                                                                                                                                                                                                                                                                                             | CO3 |
| 9.                                                                                                                                                                                                                                                                                                                         | Create console/windows application showing the use of Array List - its methods and properties.                                                                                                                                                                                                                                                                                                              | CO3 |
| 10.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the use of Enumeration, Constants and Structures.                                                                                                                                                                                                                                                                                                                | CO3 |
| 11.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the declaration and use of user defined functions.                                                                                                                                                                                                                                                                                                               | CO3 |
| 12.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the use of different argument passing mechanism – ByVal, ByRef, Optional and Paramarray.                                                                                                                                                                                                                                                                         | CO3 |
| 13.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the declaration and use of Class with Data members, Function Member, Constructor Member, Destructor Member, Event Member, Property Member, Shared Member, Type Member.                                                                                                                                                                                           | CO4 |
| 14.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the implementation of Inheritance.                                                                                                                                                                                                                                                                                                                               | CO4 |
| 15.                                                                                                                                                                                                                                                                                                                        | Create console/windows application showing the use of Polymorphism.                                                                                                                                                                                                                                                                                                                                         | CO4 |
| <b>Application Based Practicals (Implement minimum 5 out of 10 practicals)</b>                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                             |     |
| 16.                                                                                                                                                                                                                                                                                                                        | Write a Program to find diameter, circumference and area of circle using procedure.                                                                                                                                                                                                                                                                                                                         | CO1 |
| 17.                                                                                                                                                                                                                                                                                                                        | Write a Program to find maximum between three numbers using select case and if-else.                                                                                                                                                                                                                                                                                                                        | CO1 |
| 18.                                                                                                                                                                                                                                                                                                                        | Create Basic calculator with all the functionalities.                                                                                                                                                                                                                                                                                                                                                       | CO2 |
| 19.                                                                                                                                                                                                                                                                                                                        | Create a basic Digital or Analog Clock using Timer, Image, Button, ComboBox and other relevant controls.                                                                                                                                                                                                                                                                                                    | CO2 |
| 20.                                                                                                                                                                                                                                                                                                                        | Write a Program to find second largest element and second smallest element in an array.                                                                                                                                                                                                                                                                                                                     | CO3 |
| 21.                                                                                                                                                                                                                                                                                                                        | Write a program to create an arraylist of 10 elements. Create a procedure to add new element at the specific location in the arraylist and display the updated arraylist.                                                                                                                                                                                                                                   | CO3 |
| 22.                                                                                                                                                                                                                                                                                                                        | Write a program to validate the username and password entered by user and create userdefined exception to prompt message on three consecutive wrong password entries.                                                                                                                                                                                                                                       | CO3 |
| 23.                                                                                                                                                                                                                                                                                                                        | Create a Class Box with following private data members length, breadth, height and function getVolume, and public member functions input and output. Create an object of class and call appropriate functions.                                                                                                                                                                                              | CO4 |
| 24.                                                                                                                                                                                                                                                                                                                        | Create a class Rectangle, with protected members width and height, public procedure setWidth and setHeight, getArea. Inherit it in another Class ShrinkRectangle with a data member shrink factor. Create object of the class and call appropriate member functions. Create appropriate class to demonstrate overloading of function 'area' for finding area of a circle, square, rectangle and a triangle. | CO4 |
| 25.                                                                                                                                                                                                                                                                                                                        | Create a class Book with data members: BookId, BookName, Cost, Pages. Member property to add data to all its data members, function to find cost per page. Create five objects of 5 books and find total cost.                                                                                                                                                                                              | CO4 |
| <b>Note:</b> <ol style="list-style-type: none"> <li>1. In total 15 practical's to be implemented.</li> <li>2. Two additional practical may be given by the course instructor.</li> <li>3. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                             |     |



Course Code: BCA 136  
Course Name: Statistical Analysis using Excel

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in a balanced way.

**LEARNING OBJECTIVES:**

In this course, the learners will be able to apply the concepts pertaining to the following:-

1. The understanding of the basic concepts of statistics
2. Using Excel for applying the Statistical concepts in day to day operations

**PRE-REQUISITES:**

1. The student must be adequate knowledge of working in MS Excel
2. The student must be well versed in the basic concepts of Statistics

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:-

| CO # | Detailed Statement of the CO                                                                                                                                                   | *BT Level | Mapping to PO #                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------|
| CO1  | Understand the basic concepts of statistics and its application in the real life scenarios                                                                                     | BTL2      | PO1, PO2, PO3                     |
| CO2  | Understand the means and mechanisms for applying the various skills used in the process of generating various statistical concepts by using MS Excel software                  | BTL3      | PO1, PO2, PO3, PO5, PO8           |
| CO3  | Developing the skills needed for understand the various features of MS Excel software which assist the user in the process of deriving statistical measures                    | BTL3      | PO1, PO2, PO3, PO4, PO5, PO7      |
| CO4  | Understand the skill needed to draw various forms of graphical representation based on statistical data                                                                        | BTL4      | PO2, PO3, PO4, PO6                |
| CO5  | Understand the various features of MS Excel involved in the process of compilation and summarizing of Statistical data and the skills needed to interpret the statistical data | BTL5      | PO2, PO3, PO4, PO5, PO6, PO7, PO8 |
| CO6  | Understand the skills needed to ensure the process of integrating data from multiple in MS Excel                                                                               | BTL6      | PO2, PO3, PO5, PO6, PO7, PO8      |

**UNIT – I**

Chapter/Book Reference: TB1 [Chapters 1, 2]; TB2 [Chapters 1, 3];

Introduction to Statistics: Defining statistics, Importance of Statistics, application of statistics in real life scenarios. The skills and characteristics needed to deal with the data. The importance of IT tools in the usage of statistical data. MS Excel as the IT tool for dealing with statistical data. Features of MS Excel

**UNIT – II**

Chapter/Book Reference: TB1 [Chapter 6]; TB2 [Chapter 7]



Introduction to MS Excel. Basic structure of MS Excel. Cells, range, Tabs and the importance of formulae in MS Excel for dealing with statistical data. Introduction to Data analysis tab and the various statistical features available in data analysis tab. Installing Data analysis tab. using statistical functions of MS Excel for data analysis

### UNIT – III

**Chapter/Book Reference:** TB1 [Chapter 7]; TB2 [Chapter 9]

The application of Measures of central tendency by using MS Excel. Frequency distribution, Graphical representation of data along with formatting features of various graphs. Measures of Central Tendency with its illustration in MS Excel

### UNIT – IV

**Chapter/Book Reference:** TB1 [Chapter 8]; TB2 [Chapter 11]

The measures of Dispersion by using MS Excel. The consolidation of data by using Pivot table, The Data table, Scenarios and Goal seek functions by using data to predict future scenarios. The illustration of cro-relation and regression in predicting

### TEXT BOOKS:

**TB1.** Understanding Educational Statistics Using Microsoft Excel and SPSS. Edition No. 1, Martin Lee Abbott, John Wiley and Sons. Ltd, 2011

**TB2.** Statistics For Management Using Microsoft Excel, Ash Narain Sah, John Wiley, 2018

### REFERENCE BOOKS:

**RB1.** Statistics with Microsoft Excel by Dretzke, Beverly Jean, Prentice Hall, 2019

**RB2.** Applied Statistics with Microsoft Excel, Gral Keller, Cengage, 2015

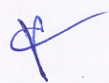
| List of Practical |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|----------------------|-----------|-----|-------|--------|-----|-------|-----------|-----|-------|---------|-----|-------|-----|
| S. No             | Detailed Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mapping to CO #      |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| 1.                | <p>Enter the marks of 20 students in the given order</p> <ul style="list-style-type: none"> <li>Serial number</li> <li>Name of the student</li> <li>Name of the college</li> <li>Class</li> <li>Subject-1</li> <li>Subject -2</li> <li>Subject -3</li> <li>Subject -4</li> </ul> <p>In a separate columns, perform the following operations<br/>Calculate the following</p> <ol style="list-style-type: none"> <li>Total marks of all the subjects</li> <li>Percentage of marks for each of the students</li> <li>Allotment of grades based on the criterion. <ul style="list-style-type: none"> <li>If the marks are more than 75% then the result is "Pass" else "Fail"</li> </ul> </li> <li>Now in other column allot the grades based on the following criterion <ul style="list-style-type: none"> <li>If the marks are more than 90% then grade is "A"</li> <li>If the marks are more than or equal to 75 and less than 90% then the grade is "B" else the grade if "C" provided that the result is "Pass"</li> </ul> </li> </ol> | CO1                  |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| 2.                | <p>From the following table, calculate the following</p> <table> <tr> <th>City</th><th>Number of Schools</th><th>Number of candidates</th></tr> <tr> <td>New Delhi</td><td>300</td><td>30000</td></tr> <tr> <td>Mumbai</td><td>450</td><td>45000</td></tr> <tr> <td>Bengaluru</td><td>500</td><td>48000</td></tr> <tr> <td>Chennai</td><td>480</td><td>67000</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | City                 | Number of Schools | Number of candidates | New Delhi | 300 | 30000 | Mumbai | 450 | 45000 | Bengaluru | 500 | 48000 | Chennai | 480 | 67000 | CO2 |
| City              | Number of Schools                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Number of candidates |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| New Delhi         | 300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 30000                |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| Mumbai            | 450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 45000                |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| Bengaluru         | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 48000                |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |
| Chennai           | 480                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 67000                |                   |                      |           |     |       |        |     |       |           |     |       |         |     |       |     |



|                  | Trivandrum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 459              | 77000      |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
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|                  | <ul style="list-style-type: none"><li>The average number of students in the entire distribution</li><li>The standard deviation of the distribution</li><li>The correlation coefficient between the number of schools and the number of candidates</li><li>The regression equation between number of students and number of candidates</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 3.               | From the following data calculate the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |            | CO4, CO5    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | <table><tr><th>Base City</th><th>Department</th><th>Client</th><th>Location</th><th>Nationality</th></tr><tr><td>New Delhi</td><td>Marketing</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Advertising</td><td>Hilfiger</td><td>London</td><td>English</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr><tr><td>Chennai</td><td>Human Resource</td><td>Nike</td><td>Sydney</td><td>Dutch</td></tr><tr><td>Trivandrum</td><td>Advertising</td><td>Allen Solley</td><td>Frankfurt</td><td>Japanese</td></tr><tr><td>New Delhi</td><td>Quality Control</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Advertising</td><td>Hilfiger</td><td>Seoul</td><td>Korean</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr><tr><td>Chennai</td><td>Human Resource</td><td>Nike</td><td>Sydney</td><td>Dutch</td></tr><tr><td>Trivandrum</td><td>Advertising</td><td>Armani</td><td>Frankfurt</td><td>Russian</td></tr><tr><td>New Delhi</td><td>Marketing</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Production</td><td>Hilfiger</td><td>Copenhagen</td><td>English</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr><tr><td>Chennai</td><td>Human Resource</td><td>Nike</td><td>Sydney</td><td>Russian</td></tr><tr><td>Trivandrum</td><td>Advertising</td><td>Gucci</td><td>Frankfurt</td><td>Japanese</td></tr><tr><td>New Delhi</td><td>Quality Control</td><td>Adidas</td><td>New York</td><td>American</td></tr><tr><td>Mumbai</td><td>Advertising</td><td>Hilfiger</td><td>London</td><td>Korean</td></tr><tr><td>Bengaluru</td><td>Human Resource</td><td>Woodland</td><td>Paris</td><td>Spanish</td></tr><tr><td>Chennai</td><td>Human Resource</td><td>Nike</td><td>Sydney</td><td>Dutch</td></tr><tr><td>Trivandrum</td><td>Advertising</td><td>Allen Solley</td><td>Frankfurt</td><td>Japanese</td></tr></table> | Base City        | Department |             | Client | Location | Nationality | New Delhi | Marketing | Adidas | New York | American | Mumbai | Advertising | Hilfiger | London | English | Bengaluru | Human Resource | Woodland | Paris | Spanish | Chennai | Human Resource | Nike | Sydney | Dutch | Trivandrum | Advertising | Allen Solley | Frankfurt | Japanese | New Delhi | Quality Control | Adidas | New York | American | Mumbai | Advertising | Hilfiger | Seoul | Korean | Bengaluru | Human Resource | Woodland | Paris | Spanish | Chennai | Human Resource | Nike | Sydney | Dutch | Trivandrum | Advertising | Armani | Frankfurt | Russian | New Delhi | Marketing | Adidas | New York | American | Mumbai | Production | Hilfiger | Copenhagen | English | Bengaluru | Human Resource | Woodland | Paris | Spanish | Chennai | Human Resource | Nike | Sydney | Russian | Trivandrum | Advertising | Gucci | Frankfurt | Japanese | New Delhi | Quality Control | Adidas | New York | American | Mumbai | Advertising | Hilfiger | London | Korean | Bengaluru | Human Resource | Woodland | Paris | Spanish | Chennai | Human Resource | Nike | Sydney | Dutch | Trivandrum | Advertising | Allen Solley | Frankfurt | Japanese |  |  |
| Base City        | Department                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Client           | Location   | Nationality |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| New Delhi        | Marketing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Adidas           | New York   | American    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Mumbai           | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Hilfiger         | London     | English     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Bengaluru        | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Woodland         | Paris      | Spanish     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Chennai          | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nike             | Sydney     | Dutch       |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Trivandrum       | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Allen Solley     | Frankfurt  | Japanese    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| New Delhi        | Quality Control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Adidas           | New York   | American    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Mumbai           | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Hilfiger         | Seoul      | Korean      |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Bengaluru        | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Woodland         | Paris      | Spanish     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Chennai          | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nike             | Sydney     | Dutch       |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Trivandrum       | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Armani           | Frankfurt  | Russian     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| New Delhi        | Marketing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Adidas           | New York   | American    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Mumbai           | Production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Hilfiger         | Copenhagen | English     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Bengaluru        | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Woodland         | Paris      | Spanish     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Chennai          | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nike             | Sydney     | Russian     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Trivandrum       | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Gucci            | Frankfurt  | Japanese    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| New Delhi        | Quality Control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Adidas           | New York   | American    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Mumbai           | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Hilfiger         | London     | Korean      |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Bengaluru        | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Woodland         | Paris      | Spanish     |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Chennai          | Human Resource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nike             | Sydney     | Dutch       |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Trivandrum       | Advertising                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Allen Solley     | Frankfurt  | Japanese    |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | Using Pivot table, determine <ul style="list-style-type: none"><li>The number of Nationality per Location</li><li>The number of Department / location / client</li><li>The number of client / location / nationality</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 4.               | A finance company wants to publish the following table                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |            | CO5         |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | <table><tr><th>Qty ↓ / Price →</th><th>10</th><th>20</th><th>30</th><th>40</th></tr><tr><td>25</td><td>250</td><td>500</td><td>750</td><td>1000</td></tr><tr><td>35</td><td>350</td><td>700</td><td>1050</td><td>1400</td></tr><tr><td>45</td><td>450</td><td>900</td><td>1350</td><td>1800</td></tr><tr><td>55</td><td>550</td><td>1100</td><td>1650</td><td>2200</td></tr><tr><td>65</td><td>650</td><td>1300</td><td>1950</td><td>2600</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Qty ↓ / Price →  | 10         |             | 20     | 30       | 40          | 25        | 250       | 500    | 750      | 1000     | 35     | 350         | 700      | 1050   | 1400    | 45        | 450            | 900      | 1350  | 1800    | 55      | 550            | 1100 | 1650   | 2200  | 65         | 650         | 1300         | 1950      | 2600     |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Qty ↓ / Price →  | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20               | 30         | 40          |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 25               | 250                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 500              | 750        | 1000        |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 35               | 350                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 700              | 1050       | 1400        |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 45               | 450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 900              | 1350       | 1800        |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 55               | 550                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1100             | 1650       | 2200        |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 65               | 650                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1300             | 1950       | 2600        |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | Using Data table, prepare the above tabular distribution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| 5                | Using the Goal seek function of Excel, prepare the following table for calculating the amount based on the simple interest formula.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |            | CO1         |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | <table><tr><th>Principle Amount</th><td>1000</td></tr><tr><th>Rate</th><td>0.02</td></tr><tr><th>Time</th><td>2</td></tr><tr><th>Amount</th><td>1040</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Principle Amount | 1000       |             | Rate   | 0.02     | Time        | 2         | Amount    | 1040   |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Principle Amount | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Rate             | 0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Time             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
| Amount           | 1040                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |
|                  | Simulate the amount by differing values of <ul style="list-style-type: none"><li>Principle amount</li><li>Rate</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |            |             |        |          |             |           |           |        |          |          |        |             |          |        |         |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |           |                 |        |          |          |        |             |          |       |        |           |                |          |       |         |         |                |      |        |       |            |             |        |           |         |           |           |        |          |          |        |            |          |            |         |           |                |          |       |         |         |                |      |        |         |            |             |       |           |          |           |                 |        |          |          |        |             |          |        |        |           |                |          |       |         |         |                |      |        |       |            |             |              |           |          |  |  |



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Course Code: BCA 138

Course Name: Designing Lab Photoshop

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0 4 2

**LEARNING OBJECTIVES:**

In this course, the learners will be able to develop expertise related to:

1. Knowledge of Tools in Photoshop.
2. Exporting images & pdf.
3. Uses of gif & digital enhancement in images.

**PRE-REQUISITES:**

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                  | BT Level     | Mapping to PO #                         |
|------|---------------------------------------------------------------|--------------|-----------------------------------------|
| CO1  | Explain the basics of graphics designing & Adobe suite        | BTL1         | PO6, PO11, PO14, PO20                   |
| CO2  | Exploring the Raster designing tools in Adobe Photoshop.      | BTL3<br>BTL5 | PO1, PO2, PO3, PO4, PO5, PO8, PO11-PO20 |
| CO3  | Exploring the Vector designing tools in Adobe Photoshop.      | BTL3<br>BTL5 | PO6, PO7, PO9, PO13, PO11-PO20          |
| CO4  | Exploring the image filters & adjustments in Adobe Photoshop. | BTL3<br>BTL5 | PO10, PO11-PO20                         |

**UNIT – I**

**No. of Hours: 11**

Introduction to graphic designing, Input/Output Technologies, Color Coding: RGB, CMYK, Grayscale, Bitmap, Color Channel, Resolution, Printing Templates, Raster Images, Vector Images, Measurement Units & Conversion, Introduction to Adobe suite & Photoshop.

**UNIT – II**

**No. of Hours: 11**

Introduction to Layers, Groups & Smart Objects, Color Picker, Selection Tools & Marquee Tool, Crop Tool, Brush Tool, Clone & Patch Tools, Eraser Tools, Coloring Tools, Text Tools, Hand & Zoom Tools, Background & Foreground Colors, Image Mask, Alignment Controls, Transform Controls, Importing Images in Photoshop.

**UNIT – III**

**No. of Hours: 11**

Introduction to Shapes & Shape Tools, Path & Direct Selection Tools, Pen Tool, Image Editing Tools, Layers Style, Filters, Blend Modes, Image Adjustment Options, Window Menu Options, Layer Mask.

**UNIT – IV**

**No. of Hours: 11**

Introduction to Photoshop Filter: Blur, Distort, Noise, Render, Sharpen, Stylize, Exporting Images & PDF, Introduction to GIF & Timeline Window, Importing/Exporting CorelDraw Files from Photoshop.

**TEXT BOOKS:**

- TB1.** Faulkner Andrew (Author), Chavez Conrad (Author), "Adobe Photoshop CC Classroom in a Book" Adobe Press.  
**TB2.** DT Editorial Services, "Photoshop CC in Simple Steps" Dream Tech. Press.

**REFERENCE BOOKS:**

- RB1.** Lisa DaNae Dayley, Brad Dayley, "Photoshop Bible", John Wiley & Sons, Inc.  
**RB2.** Glyn Dewis, "The Photoshop Workbook: Professional Retouching and Compositing Tips, Tricks, and Techniques", Peachpit Press.  
**RB3.** Peter Bauer, "Adobe Photoshop CC For Dummies", John Wiley & Sons, Inc.



| List of Practicals                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| S. No.                                                                                                                                                                                                                                                 | Detailed Statement                                                                                                                                                                                                                                             | Mapping to CO #    |
| <b>Core Practicals (Implement minimum 8 out of 10 practicals)</b>                                                                                                                                                                                      |                                                                                                                                                                                                                                                                |                    |
| 1.                                                                                                                                                                                                                                                     | Create a file to demonstrate the use of layers, groups & smart objects.                                                                                                                                                                                        | CO2                |
| 2.                                                                                                                                                                                                                                                     | Create a photo frame in Photoshop.                                                                                                                                                                                                                             | CO2                |
| 3.                                                                                                                                                                                                                                                     | Take an image of basic shape (square, triangle, circle, rectangle and parallelogram) in Photoshop & extract these shapes from the image to different layers using marquee tools.                                                                               | CO2                |
| 4.                                                                                                                                                                                                                                                     | Create a custom brush preset in Photoshop.                                                                                                                                                                                                                     | CO2                |
| 5.                                                                                                                                                                                                                                                     | Create a custom pattern preset in Photoshop.                                                                                                                                                                                                                   | CO2                |
| 6.                                                                                                                                                                                                                                                     | Create a visiting card for yourself in Photoshop. (size=3.5 x 2 inch., color coding: CMYK)                                                                                                                                                                     | CO1, CO3,          |
| 7.                                                                                                                                                                                                                                                     | Create a file having two images (rename the layer as foreground & background image) in two different layers. Blur the background image & place the foreground image over the background image in a way both layers are visible.                                | CO3,               |
| 8.                                                                                                                                                                                                                                                     | Create a border design using a brush tool.                                                                                                                                                                                                                     | CO2                |
| 9.                                                                                                                                                                                                                                                     | Create basic shapes (square, triangle, circle, rectangle and parallelogram) in Photoshop on a single layer using the shape tools.                                                                                                                              | CO3,               |
| 10.                                                                                                                                                                                                                                                    | Create a simple GIF in Photoshop.                                                                                                                                                                                                                              | CO4                |
| <b>Application Based Practicals (Implement minimum 5 out of 10 practicals)</b>                                                                                                                                                                         |                                                                                                                                                                                                                                                                |                    |
| 11.                                                                                                                                                                                                                                                    | Create a digital invitation card in Photoshop and export it in PDF Format. Use the Photograph (Practical 7) or GIF (Practical 10) and border (Practical 8) along with other features of Photoshop as per your requirements. (size=A8 or A4, color coding: RGB) | CO1, CO2, CO3, CO4 |
| 12.                                                                                                                                                                                                                                                    | Create a custom Desktop background in Photoshop.                                                                                                                                                                                                               | CO2, CO3, CO4      |
| 13.                                                                                                                                                                                                                                                    | Create a water drop and heart shape in Photoshop using the shapes tools or Pen Tool.                                                                                                                                                                           | CO3                |
| 14.                                                                                                                                                                                                                                                    | Create a "Save Water" Poster from the shapes created in Practical 13. (size=A8 or A4, color coding: CMYK)                                                                                                                                                      | CO1, CO2, CO3, CO4 |
| 15.                                                                                                                                                                                                                                                    | Perform Digital Makeup on the Photograph of some celebrity in Photoshop.                                                                                                                                                                                       | CO2, CO3, CO4      |
| 16.                                                                                                                                                                                                                                                    | Create a cartoon character in Photoshop using the Shape and Pen Tools.                                                                                                                                                                                         | CO2, CO3, CO4      |
| 17.                                                                                                                                                                                                                                                    | Create a chocolate bar with the brand name in Photoshop. The individual cube of the chocolate must have a 3D Visual Effect.                                                                                                                                    | CO2, CO3, CO4      |
| 18.                                                                                                                                                                                                                                                    | Create your company logo in Photoshop.                                                                                                                                                                                                                         | CO2, CO3, CO4      |
| 19.                                                                                                                                                                                                                                                    | Create a magazine Cover in Photoshop.                                                                                                                                                                                                                          | CO2, CO3, CO4      |
| 20.                                                                                                                                                                                                                                                    | Create a Thanks Giving card & export it in Pdf (size=A8 or A4, color coding: RGB)                                                                                                                                                                              | CO1, CO2, CO3, CO4 |
| <b>Note:</b><br>1. In total 15 practicals to be implemented. 2 additional practical may be given by the course instructor.<br>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course. |                                                                                                                                                                                                                                                                |                    |



**Course Code: BCA 172**

**Course Name: Practical-IV WBP Lab**

**L T/P C**

**0 4 2**

**LEARNING OBJECTIVES:**

In this course, the learners will be able to develop expertise related to:

1. Understand the syntax and semantics of PHP language
2. Design and develop web applications using PHP as a server side language
3. Perform database connectivity using MYSQL as database server.

**PRE-REQUISITES:**

1. Knowledge of HTML, CSS, Javascript, bootstrap and XML.
2. Able to Design Static Website.

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO #               | Detailed Statement of the CO                                                                                                                           | BT Level        | Mapping to PO #         |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------|
| CO1                | Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's.                                           | BTL3            | PO1, PO2, PO3,PO7       |
| CO2                | Have a good understanding of Web Application Terminologies                                                                                             | BTL1, BTL2      | PO1, PO2, PO3,PO7, PO10 |
| CO3                | Learn how to link and publish web sites                                                                                                                | BTL1, BTL2      | PO1, PO2, PO3,PO4       |
| List of Practicals |                                                                                                                                                        |                 |                         |
| S. No.             | Detailed Statement                                                                                                                                     | Mapping to CO # |                         |
| Core Practicals    |                                                                                                                                                        |                 |                         |
| 1.                 | Write regular expressions including modifiers, operators, and metacharacters.                                                                          | CO1, CO2        |                         |
| 2.                 | Write a program to show the usage of nested if statement.                                                                                              | CO1, CO2        |                         |
| 3.                 | Write a Program in PHP for type Casting Of a Variables                                                                                                 | CO1, CO2        |                         |
| 4.                 | Write a program to create a menu driven program and show the usage of switch-case.                                                                     | CO1, CO2        |                         |
| 5.                 | Write a program to show the usage of for/while/do while loop                                                                                           | CO1, CO2        |                         |
| 6.                 | Write a program to perform all four types of sorting                                                                                                   | CO1, CO2        |                         |
| 7.                 | Write a program to implement Array-pad(),array_slice(),array_splice(),list() functions.(use foreach wherever applicable)                               | CO1, CO2        |                         |
| 8.                 | Write a program to show the application of user defined functions.                                                                                     | CO1, CO2        |                         |
| 9.                 | Write a program that Passes control to another page (include, require, exit and die functions)                                                         | CO1, CO2        |                         |
| 10.                | Write a program to validate the form data using Filter_var() function.                                                                                 | CO1, CO2        |                         |
| 11.                | Write a program to show the usage of Cookie.                                                                                                           | CO1, CO2        |                         |
| 12.                | Write a program to show the usage of Session                                                                                                           | CO1, CO2        |                         |
| 13.                | Write a program to implement oops concepts.                                                                                                            | CO1, CO2        |                         |
| 14.                | Do Form handling In PHP Design a personal Information form , then Submit & Retrieve the Form Data Using \$ GET(), \$ POST() and \$ REQUEST() Variables | CO1, CO2        |                         |
| 15.                | Design A Login Form and Validate that Form using PHP Programming                                                                                       | CO1, CO2        |                         |
| 16.                | Create Admin Login ,Logout form using session variables                                                                                                | CO1, CO2        |                         |
| 17.                | Write a program to create a file.                                                                                                                      | CO1, CO2        |                         |
| 18.                | Write a program that use various PHP library functions, and that manipulate files and directories.                                                     | CO1, CO2        |                         |
| 19.                | Write a program to read and display the content of previously created file.                                                                            | CO1, CO2        |                         |
| 20.                | Write a program to modify the content of an existing file.                                                                                             | CO1, CO2        |                         |
| 21.                | Create a web page and which provides File uploading and downloading a file.                                                                            | CO1, CO2        |                         |
| 22.                | Design a from which upload And Display Image in PHP                                                                                                    | CO1, CO2        |                         |
| 23.                | Use phpMyAdmin and perform the following:<br>import, review data and structure, run SQL statements, create users and privileges                        | CO1, CO2        |                         |
| 24.                | Write a program to create a mysql database.                                                                                                            | CO1, CO2        |                         |
| 25.                | Write a program to create a table and insert few records into it using form.                                                                           | CO1, CO2        |                         |
| 26.                | Write a program to select all the records and display it in table.                                                                                     | CO1, CO2        |                         |
| 27.                | Write a program to modify (delete/modify/add) a table.                                                                                                 | CO1, CO2        |                         |



|                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 28.                                                                                                                                                                                                                                                                   | Write a PHP script, to check whether the page is called from 'https' or 'http'.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO1, CO2 |
| <b>Application Based Practical</b>                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |
| 29.                                                                                                                                                                                                                                                                   | Write a program to verify text data as per the pattern.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CO3      |
| 30.                                                                                                                                                                                                                                                                   | Create a dynamic website by incorporating the following functionalities: <ul style="list-style-type: none"><li>• Implement a basic registration and login system, with styling,</li><li>• Make the database connection</li><li>• Make a connection to a MySQL database, and log in with valid credentials.</li><li>• Create Dynamic, interactive and database - Driven web application using php &amp; mysql</li><li>• Perform some validation check. If any of these operations cause an error, stop execution and print the error message. The script should respond differently depending on the situation.</li></ul> Add a "Log Out" button to logout from the system | CO3      |
| <b>Note:</b><br><b>1. In total 15 practical's to be implemented. 2 additional practical may be given by the course instructor.</b><br><b>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |



**Course Code: BCA 174**  
**Course Name: Practical-V DS Lab**

**L T/P C**  
**0 4 2**

**LEARNING OBJECTIVES:**

In this course, the learners will be able to develop expertise related to:

1. Implement various types of data structures using C
2. Implement different operations on linear and non-linear data structures

**PRE-REQUISITES:**

C Programming Skills

**COURSE OUTCOMES (COs):**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                             | BT Level | Mapping to PO #         |
|------|--------------------------------------------------------------------------|----------|-------------------------|
| CO1  | Implement basic operations on static linear data structures.             | BTL3     | PO1, PO2, PO3, PO4      |
| CO2  | Implement various operations on dynamic linear data structures.          | BTL6     | PO1, PO2, PO3, PO4, PO5 |
| CO3  | Implement basic operations on non-linear data structures                 | BTL3     | PO1, PO2, PO3, PO4, PO5 |
| CO4  | Implement searching techniques on linear and non-linear data structures. | BTL4     | PO1, PO2, PO3, PO4      |
| CO5  | Implement sorting techniques on one dimensional array.                   | BTL4     | PO1, PO2, PO3, PO4      |

**List of Practical**

| S. No.                                                                       | Detailed Statement                                                                                                                          | Mapping to CO #    |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>Core Practicals (Implement minimum 8 out of 10 practicals)</b>            |                                                                                                                                             |                    |
| 1.                                                                           | WAP to implement following operation on one dimensional array (i) Insertion (ii) Deletion (iii) Traversal (iv) Reverse (v) Merge            | CO1                |
| 2.                                                                           | WAP to Sort an array using menu driven:<br>(i) BUBBLE SORT (ii) MERGE SORT (iii) INSERTION SORT (iv) SELECTION SORT                         | CO1, CO5           |
| 3.                                                                           | WAP to implement a Singly Linked List.                                                                                                      | CO2                |
| 4.                                                                           | WAP to implement a Circular Linked Lists                                                                                                    | CO2                |
| 5.                                                                           | WAP to implement Doubly Linked Lists                                                                                                        | CO2                |
| 6.                                                                           | Write a menu driven program to implement (i) Static Stack (ii) Dynamic Stack.                                                               | CO1, CO2           |
| 7.                                                                           | WAP to implement a (i) Static (ii) Dynamic Circular Queue                                                                                   | CO1, CO2           |
| 8.                                                                           | WAP to implement a (i) Static (ii) Dynamic De-Queue.                                                                                        | CO1, CO2           |
| 9.                                                                           | Implement recursive algorithms for the following operations on Binary Search Tree<br>a) Insertion<br>b) Searching                           | CO1, CO2, CO3, CO4 |
| 10.                                                                          | Implement recursive algorithms for BST traversal- Inorder, Preorder, Postorder.                                                             | CO2, CO3           |
| <b>Application Based Practical (Implement minimum 5 out of 10 practical)</b> |                                                                                                                                             |                    |
| 11.                                                                          | WAP to search & display the location of an element specified by the user, in an array using (i) Linear Search (ii) Binary Search technique. | CO1, CO4           |
| 12.                                                                          | WAP to accept a matrix from user, find out matrix is sparse or not and convert into triplex matrix.                                         | CO1                |
| 13.                                                                          | WAP to implement Polynomial addition operation using linked list.                                                                           | CO2                |
| 14.                                                                          | Write a C program to create two linked lists from a given list in following way<br>INPUT List:- 1 2 3 4 5 6 7 8 9 10                        | CO2                |



|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                 | <p>OUTPUT:-<br/>First List:- 1 3 5 7 9<br/>Second List:- 2 4 6 8 10</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
| 15.                                                                                                                                                                                                                                                                             | <p>WAP to implement Student Database using Linked List with the following structure</p> <ul style="list-style-type: none"> <li>Name</li> <li>Rollno</li> <li>Marks of 5 subjects</li> <li>Average</li> <li>Result, If the average &lt; 50, then print 'Fail', otherwise 'Pass'</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                        | CO2      |
| 16.                                                                                                                                                                                                                                                                             | Write a program to convert Infix to equivalent (i) Prefix expression (ii) Postfix expression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CO1      |
| 17.                                                                                                                                                                                                                                                                             | Write a program to evaluate (i) Prefix Expression (ii) Postfix Expression using stack.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO1      |
| 18.                                                                                                                                                                                                                                                                             | Let us assume a Patient's coupon generator for the Doctors' clinic. The patients are given the coupons on first-come-first-serve basis. After the visit of a patient, patient-ID is kept stack-wise. At the end of the day, the count is generated from the stack. Construct a menu-based program for patients' coupons generator using an appropriate data structure.                                                                                                                                                                                                                                                                                                                                           | CO1, CO2 |
| 19.                                                                                                                                                                                                                                                                             | WAP to implement an expression tree. (For example: $(a + b / (c * d) - e)$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CO3      |
| 20.                                                                                                                                                                                                                                                                             | Sometimes a program requires two stacks containing the same type of items. Suppose two stacks are stored in separate arrays, then one stack might overflow while there is considerable unused space in the other. A neat way to avoid this problem is to put all spaces in one stack and let this stack grow from one end of the array, and the other stack starts from the other end and grows in the opposite direction, i.e., toward the first stack. In this way, if one stack turns out to be large and the other small, then they will still both fit, and there will be no overflow until all space is used. Declare a new structure that includes these two stacks and perform various stack operations. | CO1      |
| <p><b>Note:</b><br/> <b>1. In total 15 practicals to be implemented. 2 additional practical may be given by the course instructor.</b><br/> <b>2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |



**Course Code: BCA 176**

**Course Name: Practical-VI DBMS Lab**

**L T/P C**

**0 4 2**

**LEARNING OBJECTIVES:**

The course is to provide the basics of SQL. To understand RDBMS and construct queries using SQL to design a database and manipulate data in it.

**PRE-REQUISITES: NIL**

**COURSE OUTCOMES:**

After completion of this course, the learners will be able to:

| CO # | Detailed Statement of the CO                                                       | BT Level         | Mapping to PO # |
|------|------------------------------------------------------------------------------------|------------------|-----------------|
| CO1  | Understand the structure and design of relational databases.                       | BT2              | PO3             |
| CO2  | Write DDL statements in SQL to create, Modify and remove database objects          | BTL1, BTL3, BTL4 | PO3, PO5        |
| CO3  | Use constraints for the database                                                   | BTL1, BTL2, BTL3 | PO3, PO5        |
| CO4  | Write DML statements in SQL to insert, Modify and remove data from database        | BTL4             | PO3, PO5        |
| CO5  | Write SQL statements to retrieve data based on the conditions provided by the user | BTL1, BTL2, BTL3 | PO3, PO5        |
| CO6  | Use index and Views in database                                                    | BTL2             | PO3, PO5        |
| CO7  | Use structured query language (SQL) to an intermediate/advanced level              | BTL5, BTL6       | PO4             |

| List of Practicals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------|
| S. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Detailed Statement                                           | Mapping to CO # |
| <b>Core Practicals (Implement All the mentioned practicals )</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                              |                 |
| <p><b>The following are two suggestive databases. The students may use any one or both databases for their core practicals. However, the instructor may provide any other databases for executing these practical.</b></p> <p><b>1. COLLEGE DATABASE:</b></p> <p>STUDENT (USN, SName, Address, Phone, Gender)<br/>           SEMSEC (SSID, Sem, Sec)<br/>           CLASS (USN, SSID)<br/>           SUBJECT (Subcode, Title, Sem, Credits)<br/>           IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)</p> <p><b>2. COMPANY DATABASE:</b></p> <p>EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)<br/>           DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)<br/>           DLOCATION (DNo, DLoc)<br/>           PROJECT (PNo, PName, PLocation, DNo)<br/>           WORKS ON (SSN, PNo, Hours)</p> |                                                              |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Draw an E-R diagram from given entities and their attributes | CO1             |



|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 2                                   | Convert the E-R diagram into a Relational model with proper constraints.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CO1 |
| 3                                   | Write queries to execute following DDL commands :<br>CREATE :Create the structure of a table with at least five columns<br>ALTER:Change the size of a particular column.<br>Add a new column to the existing table.<br>Remove a column from the table.<br>DROP: Destroy the table along with its data.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CO2 |
| 4                                   | Write queries to execute following DML commands :<br>INSERT: Insert five records in each table.<br>UPDATE: Modify data in single and multiple columns in a table<br>DELETE: Delete selective and all records from a table                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CO4 |
| 5                                   | Write queries to execute following DML command :<br>SELECT: Retrieve the entire contents of the table.<br>Retrieve the selective contents (based on provided conditions) from a table.<br>Retrieve contents from a table based on various operators i.e. string operators, logical operators and conditional operators, Boolean operators.<br>Sort the data in ascending and descending order in a table on the basis of one column or more than one column.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | CO5 |
| 6                                   | Create table using following integrity constraints:<br>Primary Key<br>Unique Key<br>Not Null<br>Check<br>Default<br>Foreign Key                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CO3 |
| 7                                   | Write queries to execute following Aggregate functions<br>Sum,Avg,Count,Minimum and Maximum value of a numeric column of a table using aggregate function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CO7 |
| 8                                   | Retrieve data from a table using alias names .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CO5 |
| 9                                   | Retrieve data of a table using nested queries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CO5 |
| 10                                  | Retrieve data from more than one table using inner join, left outer, right outer and full outer joins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CO5 |
| 11                                  | Create view from one table and more than one table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CO6 |
| 12                                  | Create index on a column of a table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CO6 |
| <b>Application Based Practicals</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
| 13                                  | Consider the Insurance company's Database given below. The primary keys are underlined and the data types are specified.<br>PERSON(driver_id# : string, name : string, address : string)<br>CAR(regno : string, model : string, year : int)<br>ACCIDENT(report_number : int, acc_date : date, location : string)<br>OWNS(driver_id# : string, regno : string)<br>PARTICIPATED(driver_id# : string, regno : string, report_number : int, damage_amount : number(10,2))<br>(i) Create the above tables by properly specified the primary key and the foreign key<br>(ii) Enter at least five tuples for each relation<br>(iii) Demonstrate how you can<br>a. Update the damage amount for the car with a specific regno, the accident with report number 12 to 25000.<br>b. Add a new accident to the database.<br>(iv) Find the total number of people who owned cars that were involved in accident in 2002.<br>(iv) Find the number of accident in which cars belonging to a specific models were involved | CO7 |
| 14                                  | Consider the following schema of a library management system. Write the SQL queries for the questions given below;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CO7 |



|                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                                                                                                                                                                                                                                                 | <p><b>Student</b>(Stud_no : integer, Stud_name: string)<br/> <b>Membership</b>(Mem_no: integer, Stud_no: integer)<br/> <b>Book</b> (book_no: integer, book_name:string, author: string)<br/> <b>Iss_rec</b> (iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)</p> <ul style="list-style-type: none"> <li>(i) Create the tables with the appropriate integrity constraints</li> <li>(ii) Insert around 10 records in each of the tables</li> <li>(iii) Display all records for all tables</li> <li>(iv) List all the student names with their membership numbers</li> <li>(v) List all the issues for the current date with student and Book names</li> <li>(vi) List the details of students who borrowed book whose author is Elmarsi &amp; Navathe</li> <li>(vii) Give a count of how many books have been bought by each student</li> <li>(viii) Give a list of books taken by student with stud_no as 1005</li> <li>(ix) Delete the List of books details which are issued as of today</li> <li>(x) Create a view which lists out the iss_no, iss_date, stud_name, book name</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |
| 15                                                                                                                                                                                                                                              | <p>Use the relations below to write SQL queries to solve the business problems specified.<br/> <b>CLIENT</b> (clientno#,name, client_referred_by#)<br/> <b>ORDER</b> (orderno#, clientno#, order_date, empid#)<br/> <b>ORDER_LINE</b> (orderno#, order line number#, item_number#, no_of_items, item_cost,shipping_date)<br/> <b>ITEM</b> (item_number#, item_type, cost)<br/> <b>EMPLOYEE</b> (empid#, emp_type#, deptno, salary, firstname, lastname)</p> <p>Notes:</p> <ul style="list-style-type: none"> <li>a. Column followed by # is the primary key of the table.</li> <li>b. Each client may be referred by another client. If so, the client number of the referring client is stored in referred_by.</li> <li>c. The total cost for a particular order line = no_of_items * item_cost.c.</li> </ul> <p>Write queries for the following</p> <ul style="list-style-type: none"> <li>(i) Create all the above tables.</li> <li>(ii) Insert at least five records.</li> <li>(iii) Display all the rows and columns in the CLIENT table. Sort by client name in reverse alphabetical order.</li> <li>(iv) Display the item number and total cost for each order line (total cost = no of items X item cost). Name the calculated column TOTAL COST.</li> <li>(v) Display all the client numbers in the ORDER table. Remove duplicates.</li> <li>(vi) Display the order number and client number from the ORDER table. Output the result in the format. Client &lt;clientno&gt; ordered &lt;orderno&gt;</li> <li>(vii) Display full details from the ORDER_LINE table where the item number is (first condition) between 1 and 200 (no &gt; or &lt; operators) OR the item number is greater than 1000 AND (second condition) the item cost is not in the list 1000, 2000, 3000 OR the order number is not equal to 1000.</li> <li>(viii) Display the client name and order date for all orders.</li> <li>(ix) Repeat query (6) but also display all clients who have never ordered anything.</li> <li>(x) Display the client name and order date for all orders using the join keywords.</li> <li>(xi) Display the client name and order date for all orders using the JOIN method.</li> <li>(xii) Display the client number, order date and shipping date for all orders where the shipping date is between three and six months after the order date.</li> <li>(xiii) Display the client number and name and the client number and name of the person who referred that client.</li> <li>(xiv) Display the client name in upper case only and in lower case only.</li> <li>(xv) Display the second to fifth characters in each client name.</li> </ul> | CO7 |
| <p><b>Note:</b><br/> <b>1. In total 15 practicals to be implemented.</b><br/> <b>2. This is a suggestive list of practicals. However, the instructor may add or change any other database for executing queries as per the requirement.</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |

**REFERENCE BOOKS:**

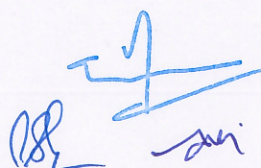


- RB1.** Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6<sup>th</sup> Edition, McGraw Hill, 2010.
- RB2.** Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
- RB3.** A. K. Majumdar, P. Battacharya, "Database Management Systems", TMH, 2017.
- RB4.** Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.



**Note on Examination of Elective Papers:**

- (a) Papers with only theory component shall have 25 marks continuous evaluation by the teacher and 75 marks term-end examinations. Both these component marks shall be reflected on the marksheet of the student.
- (b) Papers with only practical component shall have 40 marks continuous evaluation by the teacher and 60 marks term-end examinations. Both these component marks shall be reflected on the marksheet of the student.
- (c) Papers with both theory and practical components shall have 25 marks continuous evaluation by the teacher and 25 marks term-end examinations for practical and 50 marks term end examination for the theory component. All three component marks shall be reflected on the marksheet of the student.





**Implementation Rules:**

1. The examinations, attendance criteria to appear in examinations, promotion and award of the degree shall be governed by the Ordinance 11 of the University. The term "major discipline" / "primary discipline" in this document refers to the discipline in which student is admitted / studies from 3<sup>rd</sup> semester onwards.
2. Minimum duration of the Bachelor of Computer Applications (BCA) programme shall be 3 years (N=4 years) (6 semesters).
3. Maximum duration of the Bachelor of Computer Applications (BCA) programme shall be 5 years (N+2 years). After completion of N+2 years of study, if the student has appeared in the papers of all the semesters upto 6<sup>th</sup> semester, then a maximum extension of 1 year may be given to the student for completing the requirements of the degree if and only if the number of credits already earned by the student is atleast 120. Otherwise, the admission of the student shall stand cancelled. After the period of allowed study, the admission of the student shall be cancelled.
4. The MOOC courses may be taken through SWAYAM / NPTEL MOOCs platform. The student desirous of doing a specific MOOC based course must seek approval of the APC of the institution for the same before the commencement of the semester. The APC shall allow the MOOC paper to the student if and only if the MOOC subject / course being considered for the student is being offered in line with the Academic Calendar applicable. The student shall submit the successful completion certificate with marks to the institution for onwards transfer to the Examination Division. The Examinations Divisions shall take these marks on record for incorporation in the result of the appropriate semester. These marks / grades of these courses shall be used for calculation of the SGPA/CGPA of the student concerned by the examination division of the University. Though the result of the MOOC courses may be declared subsequently. The MOOC course credits shall not be considered for calculation of the promotion criterion from one academic year of study to the next academic year.
5. Maximum Credits: at least 162. The student has to appear in the examinations for these credits in all components.
6. Minimum Credits: atleast 150.
7. To earn an Honours degree, the student may enrol for 20 credits or more through SWAYAM / NPTEL MOOCs platform. This point has to be read together with other points specially point 8. The acquisition of the credits should be completed before the 15th of the July of the admission year plus 3 years. That is, if a student is admitted in the year X, then these credits must be acquired through MOOCs by 15th July of the year (X+3), no extra duration or time shall be allocated. Honours in the degree shall be awarded if and only if at least 20 credits are acquired through MOOCs. To obtain Honours in the programme, the student must apply to the institution about the same, before the commencement of the 2nd semester and about registration for the MOOCs and the specific courses through MOOCs shall be registered by the student only after approval by the Academic Programme Committee (APC) of the Institution. The APC shall approve the course if it is not already studied by the student or the student shall not study it in future and adds value to the major area of specialization (which is the degree). The papers for which the student desires to appear for Honours through MOOCs, all papers results shall be submitted by the student to the school for onwards transfer to Examination Division of the University, to be taken on record of the University. The results of these papers shall be a part of the records of the examinations of the students. The records shall be submitted by the student to the school, then transferred to the Examinations division, shall be notified by the examinations division of the University, and a separate marksheet shall be issued by the Examinations divisions. The cost of taking the MOOC course is to be borne by the concerned student. Such courses shall be reflected as additional courses / papers for the student. The "Honours" in the degree shall be awarded if and only if in addition to the 20 credits earned as specified the student has a CGPA of 7.5 or above.

If a student acquires less than 20 credits through MOOCs, following the mechanism specified, then also the results of these papers shall be taken on record as specified above, though no Honours degree shall be awarded. The papers through MOOCs for Honours degree shall not be a part of the set of the papers over which the SGPA / CGPA of the student shall be calculated.



The papers through MOOCs for Honours degree shall be additional papers studied by the students and are to be taken into account only for award of Honours in the degree programme, if 20 credits are earned through MOOCs as approved by APC, by a student. See Clause 8 also.

8. The following degree route can be taken by a student (also refer point 7):
  - a. A degree with the nomenclature **Bachelor of Computer Applications with minor specialization in <Discipline Specific Elective Group Name> (Honours)** shall be awarded if and only if the following conditions are satisfied:
    - i. The student has acquired 150 credits, to meet the minimum credit requirement.
    - ii. The student has acquired 20 credits from one Discipline Specific Elective Group. Student must pass all the subjects of Discipline specific course for the award of Bachelor of Computer Applications with Specialization.
    - iii. The honours in the degree shall be specified on the degree certificate if the student fulfills the criteria at point 7 and also has a CGPA of 7.5 or above.
  - b. A degree with the nomenclature **Bachelor of Computer Applications (Honours)** shall be awarded if and only if the following conditions are satisfied:
    - i. The student does not fulfil the criteria (a) above.
    - ii. The student has acquired 150 credits, to meet the minimum credit requirement.
    - iii. The honours in the degree shall be specified on the degree certificate if the student fulfills the criteria at point 7 and also has a CGPA of 7.5 or above.
  - c. A degree with the nomenclature **Bachelor of Computer Applications with minor specialization in <Discipline Specific Elective Group Name>** shall be awarded if and only if the following conditions are satisfied:
    - i. If the student does not fulfill the criteria at (a.) and (b) above.
    - ii. The student has acquired 150 credits, to meet the minimum credit requirement.
    - iii. The student has acquired 20 credits from one Discipline Specific Elective Group. Student must pass all the subjects of Discipline specific course for the award of Bachelor of Computer Applications with Specialization.
  - d. A degree with the nomenclature **Bachelor of Computer Applications** shall be awarded if and only if the following conditions are satisfied:
    - i. The student does not meet the criteria at (a), (b) and (c) above.
    - ii. The student has acquired 150 credits, to meet the minimum credit requirement.
9. Pass marks in every paper shall be 40.
10. Grading System shall be as per Ordinance 11 of the University.
11. The medium of instructions and examinations shall be English.



**Assessment of Outcomes Achieved in a Course / Paper. That is, Learning Outcome Assessment Alignment Grid.**

| Learning Outcome | Course/Project | How Learning Will Be Assessed | Resources | Attainment Level |
|------------------|----------------|-------------------------------|-----------|------------------|
|                  |                |                               |           |                  |
|                  |                |                               |           |                  |
|                  |                |                               |           |                  |
|                  |                |                               |           |                  |
|                  |                |                               |           |                  |

To complete the alignment grid, start by listing one learning outcome per row beneath the "Learning Outcome" column. Make sure that each learning outcome can be assessed by a single method.

Next, beneath the "Course/ Project" column, list the course(s) or project(s) or assignments or tests that students will complete in order to achieve the learning outcome.

In the "How Learning Will Be Assessed" column, list the assessment(s) tool that will be used for that particular learning outcome. It is fine for there to be more than one assessment used for a particular outcome, so long as each assessment captures the outcome in its entirety. Likewise, it is fine for a single assessment to be used for multiple outcomes.

In the column entitled "Resources", list any additional materials, technologies, or resources needed for students to meet the learning outcome.

In the column entitled "Attainment Level", list in a quantifiable manner the average attainment level.

Every teacher must make this sheet for every paper taught. Be that a paper with only theory component, only practical component or with both theory and practical component.